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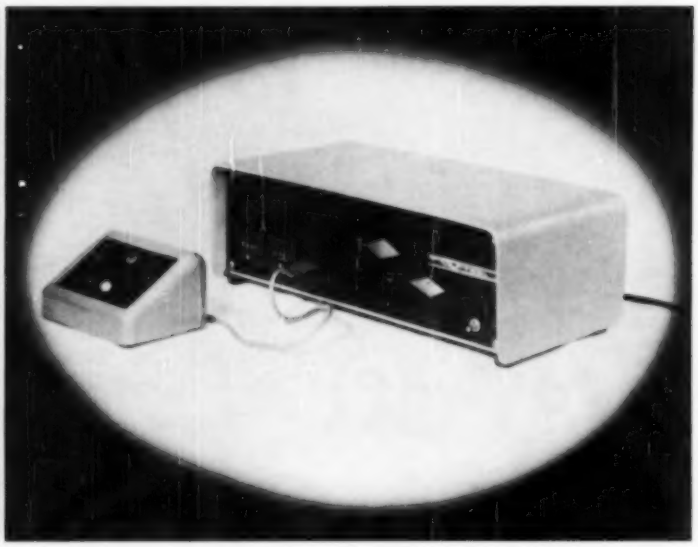

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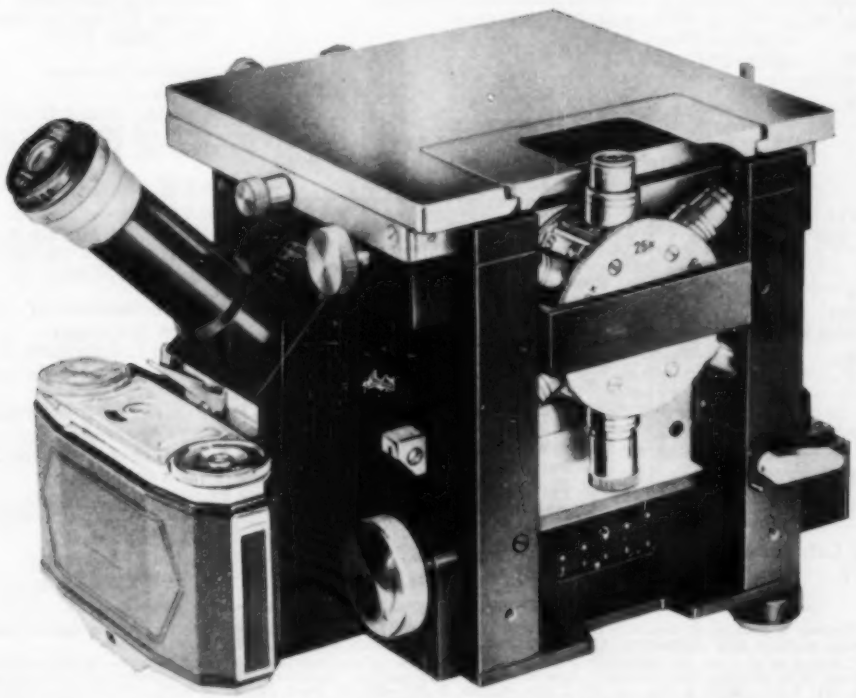

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INDUSTRIAL QUALITY CONTROL

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From the President's Desk

YOU AND YOUR REPLACEMENT

ARE YOU REALLY READY to move ahead in the quality control profession? Even though you have spent much time and effort with your personal development, there may well be an important delaying factor — the search for a suitable replacement for the vacancy you will leave behind.

The search for good men and "suitable replacements" for them is accelerating at a rate commensurate with American technical developments for which they are needed. This shortage of suitable men is the enigma of ambitious men at the helm of every growing organization.

ASQC members are moving forward and upward in their organizations. In February, on this page, I noted (with pride) that 62 percent of our members now hold supervisory or management positions.

> This is good, but we must face the sobering fact that our reservoir of technical and professional members (the remaining 38 percent of the total) is not large enough to supply the need of industry and government. This, in the face of rocketing industrial and military competition abroad.

Another sobering fact — National Bureau of Labor Statistics* indicate that on an industry wide basis, there are approximately 72 TECHNICIANS for each 100 PROFESSIONAL personnel. The percentage of our members who are inspectors or technicians is very low.

You and I must face the fact that our individual forward progress can be speeded by providing a generous amount of quality assistance to our potential aides and successors. Let us remember that each step upward on the pyramid of progress requires that we provide a capable base of support at every level. There can be no gaps!

In the quality control and reliability field, ASQC is so closely related to personal advancement that active Society membership participation has almost invariably been closely followed and paralleled by recognition of the individual and upgrading by his employers. We should not tolerate important inadequacies which deter either our Society or our personal program for advancement.

What can you and I do to provide a pattern of growth and desirable service to present and future members? Here are a few suggestions:

- Induce each member to participate in section growth and training activities.
- Encourage multi-feature section programs which will cover at least one professional and one technical (inspector-oriented) subject whenever practical.
- Instigate vigorous membership campaigns which will provide a balanced base for progress of all elements of quality control including the:

  Inspector-Technician

  Quality Control and Reliability Engineer

  Process Control Engineer

  Administrator and supervisor

Each ASQC section must take upon itself the task of closing this gap in service to our many types of members by making sure that programs, training sessions, and membership efforts are properly planned. Each professional member needs to "pitch in" and help.

Through growth of ASQC, let us increase our reservoir of technical and professional people, with a view toward progress, individually and collectively. Remember these aged axioms:

Every responsibility shirked is a failure to acquire strength.

Insure your progress by insuring the progress of others.

Jy McClure

*(NSF 60-62) "Scientific and Technical Personnel in American Industry"

The Management Of Reliability Programs

Two Basic Propositions

Quantitative Reliability is a Statistical Concept
Nothing Succeeds Unless it is Managed Correctly

Qualifications for a Manager

Technical Familiarity
Administrative Experience
Compatibility Between the Individual and the Task

Core of the Problem

The Engineer's Reaction
The Manufacturing Reaction
The Statistical Reaction

Our Conclusion

The Reliability Program will begin with a mathematical model and will end with a prediction. The goal will be measured statistically and the major steps in the program will be valid only as they fit into the statistical plan.

FRANK H. SQUIRES, ***Frank H. Squires & Associates***
Management and Quality Control Consultants
Los Angeles, California

Two Propositions

The management of reliability programs can be studied by considering two basic propositions:

1. Quantitative Reliability is a statistical concept
2. Nothing succeeds unless it is managed correctly

Quantitative reliability is a statistical concept. This is the basic fact which should be kept in mind when the program manager is being chosen.

Reliability is something we have long been familiar with, we look for it in automobiles, we hope it exists in the foundations of the houses we buy, women demand it from their potential husbands. Prompt assurances are given in all such cases and although the intent may exceed the performance it is commonly expected that the warmth of the intent will compensate for a poor performance.

Reliability Not What It Was

But reliability as understood in these common contexts is not the quantitative reliability demanded from the manufacturers of missiles and space exploration vehicles.

Quantitative reliability is the probability that a product will function as and when required in certain specified environmental conditions. The probability may be as high as 99.99 percent but the principle of imperfectibility prevents it from ever being 100 percent. Even in the limitation imposed by the principle of imperfectibility the contrast is sharply drawn between reliability as we have known it in the past and quantitative reliability. The one is a "warm" human quality, the other a "sterile" statistical fact. A 1956 printing of Webster's New Collegiate Dictionary describes "reliable" as "fit to be relied upon; trustworthy". There is no higher praise than to say that a man is trustworthy, but if it were said that he was only 99 percent trustworthy he would feel utterly condemned.

The traditional connotation attaching to the word "reliability" is so different from the new concept of quantitative reliability that we ought always to speak of "quantitative reliability" when that is what we mean, and only of "reliability" when we are modestly enumerating our virtues or referring to other equally qualitative areas where statistics are not welcome.

Reliability of the Bonhomme Richard

The reliability of chariots, windjammers, submarines and airplanes before Korea was the courage and fortitude of their human occupants. Nobody asked what the quantitative reliability of the hardware was because history had provided a thousand examples of the ability of charioteers, sailors and airmen to gain their objectives even when the hardware had suffered serious deterioration. John Paul Jones and the crippled Bonhomme Richard is a popular example.

The distinction between traditional reliability and quantitative reliability has been stressed because no reliability program can be effectively planned and successfully concluded except in cooperation with individuals who are both familiar with and in sympathy with the statistical aspects of the problem.

What They Say About Reliability

Many support the position that quantitative reliability is a statistical concept:

> In the November, 1957 issue of *Industrial Quality Control*, W. R. Davison of Phillips Petroleum Co., in "Latent Reliability," emphasizes that reliability is a statistical concept and that it can only be thought of and expressed in statistical terms. The work of Robert Lusser, late of Redstone Arsenal, Huntsville, Ala., is well known. He has constantly urged that engineers engaged in missile research and development should have enough statistics to see the problem of reliability statistically, and to encourage them to approach its solution from this position.

Karl G. McCready, Analysis Section, Northrop Aircraft,

ASQC LCS Code 810:10:419

writing in the September, 1957 issue of *Western Aviation* on "The Statistical Approach, Key to Component Reliability" says: "Design engineers must develop a better appreciation for inherent variability in nature. To this end they must comprehend the application of statistical principles and techniques to the problems of equipment design."

Reliability in an Affluent Society

It has become fashionable to speak of the reliability of technical products in general, and large areas of industrial activity have been brought under the banner of reliability. It is a question of how much this contributes to the urgent problem of designing and manufacturing missiles and space vehicles with enough reliability to win the international competition for space. The reliability of common technical products is so many times different from the reliability of missiles and space vehicles that they are, for all practical purposes, two different classes of phenomena.

A man gets into his car in the morning and it won't start. He takes the wife's, or calls up a nearby colleague, or takes the bus or calls a taxi. The mission is delayed, but not aborted. If the refrigerator goes on the blink, it is not a catastrophe, it is duplicated at the nearby market. If the radio fails the family can look at TV and if they both fail, the neighbors on both sides will be glad to have you visit and join the circle entranced by Alexander King or Ed Sullivan.

Thus, the reliability of a common technical product is not a pressing problem in the daily life of the citizen. A high degree of reliability is assured by the prosperity of the affluent society we live in and the endless multiplication of the common articles of use.

Exit the Pilot

The reliability of missiles and space vehicles is a different thing altogether. Not only are they many times more complex, they have to penetrate outer space, they have only one chance, and they have to do it without a pilot. Only now do we realize how much the vaunted reliability of airplanes depended upon the pilot. He corrected for the poor reliability of thousands of pieces of equipment which were thought to be the best of their day, as indeed they were. Nevertheless, we did not think of the pilot as being mainly responsible for the reliability, but rather, we attributed the reliability to the hardware. Not that we meant to disparage the pilot, but we took his ingenuity and resourcefulness for granted. The pilot saved the hardware and we thought the hardware had saved the pilot! Now there is only the hardware and there is now no way of knowing what the hardware will do when the button is pressed, except by a statistical forecast based on the statistical analysis of the results of thousands of statistically designed component tests. The hardware will not be statistical but the knowledge of its probable performance will be and this is the sense in which it is said that reliability is a statistical concept.

Why Is Management So Important?

The second proposition was that "nothing succeeds unless it is managed correctly." This sounds like a gratuitous truism until some specific cases are considered. Can the courage of soldiers alone win battles? The long record of history shows that courage is not enough, that superior generalship, better management, has been the deciding factor in the decisive conflicts of the past.

Is a talent for scientific research enough to guarantee the success of a scientific research program? Again, the record says that the organization, the management of the effort, is necessary to success.

Are good intentions ever enough? Most of us can remember being told as children that the streets of hell are paved with them, as parents and teachers prepared us for a world in which nothing succeeds unless it is properly organized and managed.

What qualifications must an individual have to manage successfully? There are many, but three are basic:

1. Technical Familiarity
2. Administration Experience
3. Compatibility

The word "familiarity" is deliberately chosen to exclude the possible demand that the manager must know as much as the scientists and engineers. On occasion, he may, but his duties will not require that he should exercise such knowledge. It is also meant to counter the concept of the manager who "manages people, not products." It is true that managers manage people, or guide them, or direct them, but the majority of the people who are being managed in the contemporary technological world are technicians. Mutual regard and sympathetic understanding, essential to the success of the joint effort, require that the manager and technicians be equally at home in the world of modern technology.

The need for administrative experience is self-evident. The manager must have the confidence which can only come from a considerable experience in the making of plans, from having been held responsible for their fulfilment, and from having seen them succeed.

Compatibility: The Key To Successful Management

Compatibility between the individual and the task may be the most important qualification for the successful manager. By compatibility is meant the emotional and psychological fitness of the individual for the task. One who is contemplative by nature, seeking to understand but not to convince others, disinclined to debate, is not going to be comfortable as a manager. Nevertheless, many such strive for promotion into the ranks of management, or are thrust into them, traditional education having set the same goals for all of us with little regard for inherent ability or desire.

Those with an unappeasable curiosity concerning the physical world they have done so much to change, the great scientists and inventors, can only become frustrated by the manager's necessity to count the cost, to recognize the human, material and financial limitations. Research men might say that if we had always counted the cost, we would still be living in the caves. The answer could be given that if caution had not been used, we might have been destroyed on the first foray into an unknown world. Ceaseless change and fitfull progress are the products of this constant debate and none can say which point of view is the more important. But it can be agreed that those who have to

manage, to organize and to count the cost, should be temperamentally suited to the task.

The Reliability Program

What makes an individual compatible with the duties of the manager of a reliability program? Let us consider how the program will be organized and executed.

1. It starts with an assigned reliability either from the Government to the prime contractor or from the prime to a subcontractor
2. At either facility quality control statisticians and engineers sit down together and classify the component parts and construct a mathematical model
3. Component reliabilities are assigned
4. Component tests are agreed upon and planned
5. The tests are run and data collected
6. The component reliabilities are computed from the data and the end-product reliability computed from the component reliabilities.
7. The end product reliability is compared with the level demanded by the Government or the prime contractor
8. Government and contractors confer and decide to produce hardware with this level of reliability, or decide upon a product improvement program, or decide upon both in the interests of securing some hardware, while waiting on improvement

The Core of the Problem

The core of a reliability program is the testing. The manager will have to assure himself that the proposed tests on the many components have been statistically designed. That is, he will have to know that the planned number of cycles the component is required to run has been derived from the mathematical model for the system of which the component is a part. When the tests are in progress he will have to see that the statistically validated test specifications are adhered to. It should not be assumed that this will be automatic, for experienced test supervisors know how frequently the well-intentioned want to interrupt tests in progress to try out some "improvement."

It is when failures occur that the fitness of the manager will be most clearly revealed. Assume that a certain component had been required to operate 1,000,000 cycles without failure in a specified combination of adverse environmental conditions. Let it fail at 900,000 cycles.

The Engineering Reaction

The congenitally curious will ask "Why"? and if such an individual follows his natural bent he will start a technical investigation which will rapidly develop into an effort to improve the design. Imagine tests in progress on 1,000 different components and partial failures on 250 of them. If this same reaction prevails, with the same attempt to improve the design in the case of every partial failure, the reliability confirmation program will soon be transformed into a product improvement program. That some components will have to be improved is certain, but only when the effect of a particular failure on the system as a whole has been determined, and not in spontaneous reaction to the particular failure itself. Who are the most curious? They are the scientists and engineers; the fantastic technology of today is the product of their insatiable curiosity. It is not meant to conclude that there are no engineers temperamentally fitted for reliability program management, but only that those congenitally suited for research would suffer emotional restraint and frustration if burdened with such a task. Since temperamental compatibility between the individual and the task has not been a consideration in the past, it can be assumed that there are many engineers for whom the transfer to reliability program management would be a relief and an emotional fulfillment.

The Manufacturing Reaction

How would the man with a manufacturing background react to the partial failure at 900,000 cycles? Fifty years ago the answer would almost certainly have been different from today's answer, but space exploration wasn't a reality 50 years ago and the necessity to make a statistical prediction as to the probable performance of space vehicles was not a problem. Fifty years ago production supervisors were product-oriented. Their reactions to the various problems common to production were conditioned by their knowledge of the product, as a product. About that time F. W. Taylor's time and motion studies began to influence manufacturing procedure and since then the tendency has been for production personnel to become time-conscious. Not that the product, as a product, is forgotten, but the major task facing every production supervisor is to manufacture the product in an exactly specified amount of time.

The supervisor is appraised for his ability to work within the time standards and he is most conscious of those influences which prevent him from succeeding. What are these influences or obstacles? Late arrival of purchased raw material and parts; the possible failure of Receiving Inspection to stop defective purchased parts from getting into the assembly areas; engineering design changes which necessitate the tear down and rework of partially completed assemblies; temporary power failures and equipment breakdowns. As a consequence, the harassed production supervisor tends to hold a post mortem when the time standards are exceeded. The tendency to make such investigations as a first reaction to failure or partial failure becomes a conditioned pattern of behavior.

Such behavior applied to the partial failure of one or 250 component tests in a reliability program would accumulate a mass of information which might be very useful, but only when the significance of the various partial failures to the system reliability goal has been determined.

The Statistical Reaction

The statistically-oriented individual would ask the correct question. When informed of the failure, he would ask "When?" He would want to know how many hours or cycles of operation had been completed and this is *all* he would want to know until a larger survey had given significance to this particular piece of statistical information. This tendency of the statistically-oriented manager to ask "When?" instead of "Why?" will keep the program objective sharply before the eyes of all concerned.

The objective of a quantitative reliability program should be to find out whether the product, as currently designed and manufactured, will meet the required reliability. When all of the data has

been consolidated and the reliability of the product has been determined, it will be highly desirable to approach the customer with the findings and the final figure. If the final figure falls short of the target (if the product is one of many components of an end product) it may be that the prime contractor will want to compute the reliability of the end product and submit the findings to the Government before embarking on product improvement programs in many plants across the country.

Who Should Manage?

The selection of a statistically-oriented manager will guard against the probability that the reliability program will be converted into a product improvement program before the facts make it clear this is necessary.

Two further problems complicate the situation for the selected candidate. Statistically-oriented individuals have been referred to as though they were a common category and in plentiful supply. Unfortunately, statistical measures of worth do not seem to be acceptable to the determined individualists of the Western World. Statistically-oriented individuals are not plentiful because few industrial activities in the recent past have required a constant submission to statistical discipline. They can be found in mathematical analysis groups, in quality control staffs and at various levels in those corporations reached by operations research. The slow acceptance of statistics has been treated in another paper by the writer.*

To "Manage" or Coordinate?

The word "manager" has been used because of its lack of ambiguity. But do reliability programs lend themselves to management in the traditional or hierarchical sense? It is a matter of common experience that the hierarchical type of organization tends to build walls between parallel departments. This is not surprising when we consider that it is inherent in the structure itself, the aim of which is to prescribe exactly the limits of everyone's authority and to make it clear who can do what to whom. The popularity of the hierarchical type of organization is sufficient evidence that it has satisfied many needs, particularly where it was thought desirable to distinguish the various functions from one another, as Procurement, Engineering, Production, Sales. But the execution of a quantitative reliability program will involve every department and, unless the General Manager is going to direct the program to the exclusion of his many other activities, the program will have to be directed by a coordinator.

The question "What should be managed and what should be coordinated?" can be answered by applying the range test. In this context it is understood that "to manage" means to operate by the exercise of direct authority over a group of organizational subordinates. "To coordinate" means to operate by demonstration (that such and such departmental activities are essential to the fulfilment of a general plan), by continuous integration and appraisal of company-wide results and by periodic publication of the accomplishment to date and of the task still remaining to be done. The coordinator is authorized to contact all departments and it is further understood that he receives authority from the general manager. The "range test" is then applied by asking the question, concerning any activity, "Will the execution of this task range over so many departments that you can imagine the general manager doing it?" If the answer is "Yes," there is a task for a coordinator and there can be no doubt that the directors of reliability programs offer the best opportunity yet for management by coordination.

Conclusion

A reliability program is an inquiry intended to determine the ability of the product to meet an arbitrary quantitative reliability requirement. The program will begin with a mathematical model and will end with a prediction, and while the performance required of missiles and space vehicles will make greater demands upon engineering talent and manufacturing ability than ever before, the goal will be measured statistically and the major steps in the program will be valid only as they fit into the statistical plan.

Furthermore, the fulfillment of a reliability program will involve all departments. It appears, therefore, that the program would have the highest probability of success if organized and coordinated by a statistically-oriented administrator.

* "From Certainty to Statistics", ASTM Bulletin, January, 1960

RELIABILITY PROCUREMENT

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With all the recent burgeoning of reliability research, instructions, guides, etc., the engineer finds himself in a situation similar to that of the old farmer when he responded to the advice of the County Agent by saying, "Heck, I ain't farming half as good as I know how to now."

It isn't from any lack of knowledge of statistical techniques, probability theory, or even from a dearth of hardware experimental data that we are limited; but from funding, manpower, time and knowledge of other programs.

These are basically the managerial functions, as contrasted to the technical functions of statistical and mathematical theory. The most needed advances in reliability — as in quality control — are in the managerial techniques.

Since corporate management is interested in sales and profits, management is interested in the *customer* and anything that will get more customers.

Product quality has long been recognized as one of the things that attracts new customers, and now product reliability has been added to the list. But product reliability will never be realized until management can clearly recognize it, as it must, in order to buy it and sell it intelligently. Since contracts, procurement documents, and specifications are management tools, these are the places where reliability must be made clear and understandable to management.

The Aircraft and Missile Division of ASQC has prepared a list of the reliability specifications which are employed by the military services. A cursory examination of most of these specifications will quickly show that they specify reliability in terms meaningless to corporate managements. The reliability engineer must therefore translate the language of the specifications into "managerialese."

Because the procurement documents are the instruments of communication between customer management and vendor management, he must be responsible for the inclusion in the documents of all these translated reliability specifications.

In order to deliver reliability, managements must know what it is and they must know it at the earliest possible moment in the negotiations. There is no later time to do it without incurring waste of time, money and effort, and all of these are of the essence.

To specify reliability, a procurement document must contain the following:

Mandatory Specification Requirements

1. Provision for making a final judgement as to whether or not the product meets the specification
2. Testing requirements that can lead to reproducibility in independent laboratories
3. Ease of understanding, enforcement and compliance
4. Availability of results during (not after) the particular phase of development; for example, research, prototype, or production
5. Use of proven and accepted techniques
6. A requirement for adequate progress reporting and quantitative estimates of product reliability
7. Provision for the possibility of extrapolating the reliability determination to the reliability during application

Desirable Specification Requirements

1. Encourage the gathering of realistic data and design information
2. In general, educate the contractor
3. Encourage reliability improvements in design and production
4. Reveal the potential failure pattern and failure modes
5. Minimize costs
6. Allow the contractor maximum freedom of action
7. Provide a sufficient amount of information for the customer for logistic uses, training purposes, etc.
8. Minimize the test time

However, when we examine many of the existing specifications we note many unacceptable characteristics such as:

1. No firm basis of decision or comparison is made available, the results are nebulous and a decision is often difficult
2. The data are available too late in the program to be useful as a control by either vendor or customer
3. The vendor, as well as the customer, is often asked to gamble, thereby incurring risks that are often greater than the average contractor can afford
4. The program is not only difficult to price but no price incentive is possible
5. It is often difficult to assign the responsibility for failure to meet reliability requirements between customer, vendor and sub-contractors
6. The required programs often are so vague as to be unenforceable
7. They are often difficult to understand by management and for that matter, even by technically trained personnel
8. The mathematical theory behind many of the specifications is tenuous at best
9. Amazingly enough, the specification often does not measure reliability
10. The negative of all of the desirable characteristics is often found

We also find many undesirable characteristics like:

1. No specifications for control of reliability during the design phase when the most significant contributions can be made
2. Testing a sample to destruction. This is hardly realistic when the article being purchased might be a battleship or an aircraft
3. Often the formulas of the specification provide completely unrealistic reliability goals
4. An example of the sloppiness of the specifications is the frequent confusion between "mean-time-between failure" and "life"
5. The tests made often do not reveal the characteristics of the production articles

The obvious solution to all of this is to write procurement specifications for reliability which will meet all of the mandatory and as many of the desirable characteristics as are needed, without including any of the undesirable ones. This implies a sequential test program specification in which the quantities, environmental conditions, and the accept-reject criteria are all clearly delineated. Until we achieve this goal, we shall have to depend on reliability-conscious and understanding managements to interpret what is wanted from what is said.

ASQC LCS Code 816:40:400

Total Quality Control

THROUGH

RELIABILITY

FRANK M. GRYNA, JR.

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IN THE PAST, many quality control programs have concentrated on the manufacturing phase of operations. Recently, however, the increased emphasis on reliability has made it necessary to expand the traditional quality control approach to cover design, procurement, manufacturing, test, and field operations to assure operational reliability — i.e. continued proper performance in the field. The need for a comprehensive program is illustrated by the results of an analysis of 815 equipment failures*:

43 percent of the failures were due to design

20 percent of the failures were due to manufacturing

30 percent of the failures were due to field conditions

(The remaining 7 percent were due to parts wearing out and other unknown causes.)

This article describes how Martin-Baltimore has expanded its quality control concept into a comprehensive reliability program. Included is a discussion of reliability policies, reliability organization, and a method of defining a reliability program.

Reliability Policies

Our program is based on these policies:

1. Reliability is an element of product performance distinct from capability. Capability is the ability of a product to perform a function. Reliability is the ability to perform the function *repeatedly* or when called upon to do so.
2. A reliability program must start in the proposal phase of a project and continue throughout design and development, production, test, field evaluation, and service use. This means that the program cannot be restricted to any one organizational unit but must cover all units that effect the final field reliability.
3. Adequate funds must be provided for a reliability program and these must be determined during the proposal phase. This means that a complete reliability program must be developed in sufficient detail during the proposal effort to permit adequate costing.
4. The execution of a reliability program involves both technical tasks and a management task. The technical tasks consist of the efforts to design reliability into the product and maintain this reliability throughout production and field use of the product with minimum degradation. The management task consists of integrating all of the technical efforts, and controlling these efforts to assure that all necessary steps are being taken to achieve the required reliability.
5. Reliability *results* can only be achieved by actions taken by the line organization — the designer, the production man, the procurement man, etc. The reliability specialist provides guidance and assistance to the line personnel in executing their fundamental reliability tasks.
6. The program for each project must provide a written plan and must specify responsibility, procedures, and schedules.
7. The program must include controls which will detect and report to management all deviations between plans and actual performance.
8. The program must include suppliers as well as internal Martin operations.
9. The overall integration and evaluation of the reliability program must be performed by an organization which is independent of those who are responsible for taking the detailed steps necessary to achieve the required reliability.

These policies are the foundation of the working reliability program described in the following paragraphs.

Organization for Reliability

The products of Martin-Baltimore range from electronic systems such as a flight control system to complete weapons systems such as the TM-76B Mace missile. Martin-Baltimore is organized both on a functional division basis and a program organization basis; i.e. the various functional divisions supply people to individual projects.

The Vice-President and General Manager of Martin-Baltimore has the overall responsibility for the capability *and* reliability of the product. He has delegated to the Quality and Reliability Division the responsibility for establishing, maintaining, and assuring the adequacy of an integrated reliability effort within Martin-Baltimore, and on its individual programs.

On each program, the Program Manager is responsible for capability and reliability. As the reliability program is both preventive and corrective in nature, we have found it useful to setup the project reliability organization with this in mind. Fundamental to the organizational approach is the definition of responsibilities for each of the functional divisions with the overall responsibility for the entire program resting with the Program Reliability Administrator.

A Reliability Control Team (Fig. 1) is established to enable the administrator to effectively develop and coordinate the individual divisional reliability tasks. This team consists of reliability specialists from each division on the program. Each member of the team is responsible for planning, directing, and controlling the reliability tasks defined in the program for his division. This means that he must define the tasks in writing in the reliability program document, execute and/or provide technical assistance to those performing the tasks, and continuously monitor the reliability tasks for his division. The Reliability Control Team

ASQC LCS Code 813:10:437

*Greenidge, R. M. C., "The Case of Reliability Versus Defective Components Et Al," *Electronic Applications Reliability Review*, Issue No. 1, 1953, p. 12

devotes most of its efforts to the preventive aspects of the program.

Each project also has a Corrective Action Team (Fig. 1) which is responsible for defining problem areas on actual equipment failures and following up until corrective action is put into effect and its adequacy verified. We have found that the fixing of responsibility on a Program Reliability Administrator and the use of both a Reliability Control Team and a Corrective Action Team provide continuous emphasis on both the preventive and corrective phases of the program. Within the Quality and Reliability Division a separate department—Reliability and Quality Assurance—exercises the division's function of assuring the adequacy of the overall company reliability effort, and provides the Program Reliability Administrator to act as Chairman of the Reliability Control Team.

Since a large portion of reliability activity is accomplished during the design stage, the Engineering Division has established a special reliability organization to assure implementation of the engineering portion of the program.

MRM—The Martin Reliability Management Program

We have found the following steps to be important in developing a reliability program for a specific project:

1. *Define the reliability objective in specific terms*
   From the viewpoint of defining objectives, to say that we want "high reliability" is as meaningless as saying we want "low cost." Industrial engineers insist upon cost budgets to define cost objectives. In reliability we insist upon a numerical definition of the reliability objective, e.g., a transmitter must have a 99 percent reliability for a two hour operating period. This is not always a simple matter and for weapons systems may involve military operations research techniques to determine the reliability objective for a specific equipment.
2. *Define each of the steps to be taken in the program*
   Generalities such as "use the best components available" or "maintain high quality workmanship" are meaningless in defining a reliability program. The steps must be defined in specific terms in order to permit adequate costing and develop tight controls for each step. I have found that a good criterion for a specific statement of a step in the program is whether or not the step *can* be costed. Costing is important when there are steps in the reliability program for a specific project that require efforts above those in the general company reliability program.
3. *Establish the responsibility for each step in the program*
   The responsibility for each step must be established and assigned to a single unit of the organization. This may require that a step be divided into several elements in order to assign responsibility to a single unit.
4. *Define the other organizational units concerned with each step*
   Pinpointing the responsibility for each step is basic, but most steps involve several segments of the organization. Defining the units concerned with each step shows the coordination required.
5. *Provide adequate funds for each step in the program*
   Many steps in a reliability program are a part of the normal company operating procedure and do not require additional funds. However, on a specific project, certain efforts may require additional funds. (An extensive reliability testing program is a typical example.) Sometimes,

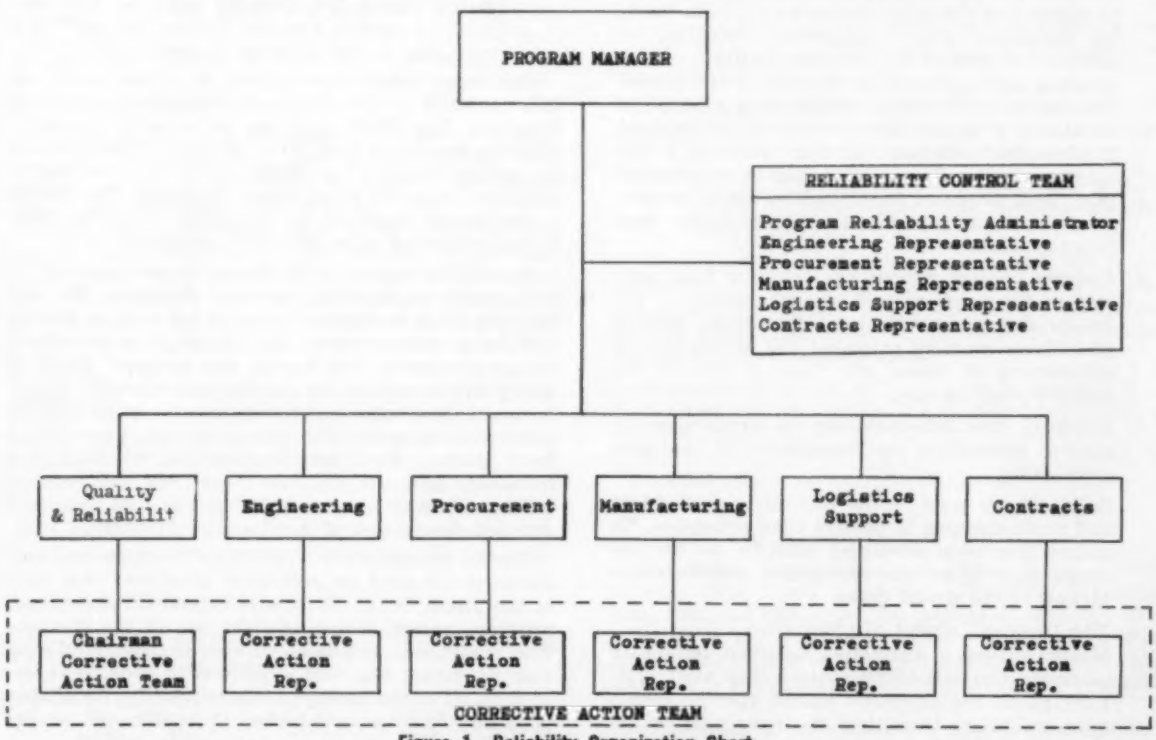

Figure 1—Reliability Organization Chart

TABLE I — Excerpts from the Martin Reliability Management (MRM) Program for the_____Project

Task	Primary Responsibility	Other Functions Concerned	Procedure Approved		Controls	Schedule	
			Date	By		Start	Compl.
Perform reliability predictions based on circuit and component analyses and use of reliability handbook. Compare to reliability budgets. If any design revisions are made, review reliability prediction and revise as required	Design Engr.	Quality	Completed	Tech. Dir.	1. Reliability predictions to be included on page and line schedule. 2. Analyses to be reviewed by group engineer. 3. All analyses must be submitted to reliability engineer for his approval.	7/1/58	10/1/59
Prepare major subcontract specifications with adequate definition of numerical reliability requirements and objectives, reliability program, tests, reports and related requirements, such as performance, environment and operational, maintenance, and checkout and support concepts.	Contracts (Specifications)	Engrg., Quality Procurement	9/15/58	Contracts Mgr.	Specifications must be reviewed by Reliability Control Team and approved by Contracts Manager before issuance to vendor.	10/1/58	2/1/59
Include reliability requirements in evaluation and selection of vendors and subcontractors.	Procurement	Engrg. Quality	8/15/58	Procurement Mgr.	1. Vendor selection to be subject to review by Reliability Control Team.	9/1/58	10/1/59
Review all designs to determine component part and assembly limitations with respect to reliability requirements using economical processes and procedures.	Electronic Mfg.	Quality	8/15/58	Mfg. Mgr.	1. All drawings must be reveiewed by Manufacturing representative prior to engineering release.	9/1/58	1/1/59
Establish failure reporting and problem resolution system from first development test through service use. a. Establish and maintain failure reporting in test areas and service use. b. Establish and maintain failure reporting in selected vendor plants.	Quality	Engrg. Mfg. Proc. Logistics Support	2/15/59	Quality Mgr.	1. Assign specific Reliability and Assurance engineer and Corrective Action Team to find problems and assure correction. 2. Monitor reporting through assigned personnel in reporting areas.	3/1/59	Compl. of Service Use
Verify handbooks (including use by anticipated skill levels) on development units. Include both plant and field verification. a. Revise handbooks and/or redesign as needed.	Logistics Support	Engrg. Quality Mfg.	10/15/59	Logistics Support Mgr.	1. Establish index of handbook errors per unit of preparation time. 2. Corrections must be approved by Logistics Support Manager.	11/1/59	2/1/60

however, all that is required is a change in the distribution of funds from a later phase of the program to an earlier phase. Defining the steps in specific terms makes it comparatively easy to estimate the funds required. However, all of this must be done in the proposal phase of a contract to assure that the submitted price contains funds for reliability either separately identified or included as part of the divisional efforts — depending upon customer preference. You can well imagine the difficulty in establishing a complete reliability program after a contract is received if adequate funds have not been included in the submitted price. Finally, it should be emphasized that funds provided for reliability are an investment that will pay off in terms of lower total program costs.

6. *Prepare written procedures detailing how each step in the program will be performed*

   As one step in assuring implementation, written procedures must be prepared and distributed in advance to all those who have a role in the specific program step.

7. *Establish time schedules for the preparation of written procedures and completion of the program step*

   Reliability is part of the overall project effort and must conform to project time schedules. To assure this, time schedules must be set for the preparation of written procedures and the completion of the actual tasks.

8. *The "control" aspect of reliability*

   Martin makes a distinction between reliability planning and reliability control. The most brilliant plans are academic unless *specific* measures are taken to control the execution of the plans. In the Martin program, the listing of tasks is regarded as a set of plans. We feel that this listing is a unique way of definitizing the program. However, for *each* task, we also state the specific controls that will be used to make sure the job is done properly. These controls are shown in Table I. Reliability controls, then, are not just a few isolated tasks — they are specific measures taken to assure that each and every step in the program is executed.

The steps listed above result in a document we call the MRM — The Martin Reliability Management Program. The MRM program for a project usually contains anywhere from 30 to 60 steps. Table I shows the actual format of an MRM and lists a few representative steps from an actual program. The MRM is the Martin approach for changing reliability from a vague concept to a definitive program.

An MRM program is developed for each project — and issued as an official project directive. We feel that the MRM document is useful not only to Martin but also to our customers. For Martin, it is not only a means of control but during the proposal phase it also provides a basis for costing the reliability effort to assure that sufficient funds have been allotted to execute the program. For our customers, it provides a description of what specific steps we will take in a reliability program and how these steps will be controlled. We welcome requests for bids that require a detailed description of a reliability program.

Martin experience with military products has emphasized the need for reliability programs that start in the initial design phase and extend throughout all program phases including field use of the product. The traditional emphasis of quality control during manufacturing has been expanded to provide an attack on all of the causes of low reliability. Reliability problems *force* a broadening of traditional quality control to the concept of total quality control.

Presentation of Reliability Information

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Introduction

One of the major problems in any reliability program is that of data presentation. How can the vast quantity of reliability information be presented to engineers and managers in a concise yet complete form? This article investigates a possible method of presentation which was borrowed from the quality control area. This method is commonly called the Master Control System.

The Master Control System

On Oct. 23, 1954, a system designated as the Master Control System was introduced by N. P. Demos* for aiding in the control of quality in a manufacturing process. This system has proved to be very useful in the field of quality control.

The basic assets of the system are its simplicity and sensitivity in detecting changes in the quality level of a process and its manner of presenting this information in a clear and concise manner to management.

Since one of the goals of a reliability system is to detect changes in the reliability of an item and present this information to management, it is only natural to adapt the features of the Master Control System to reliability.

The Master Control System has solved for quality control the problem of how to present the vast amount of data arising from the production operation in a meaningful and compact form so that a manager with no sophistication in statistics can quickly determine the quality problem areas and, at the same time, supply the engineer and foremen with the necessary information to pinpoint the quality problems. The problem of presenting vast quantities of data is magnified in a complex reliability program. In a missile program, especially in a research and development program, there are thousands of parts for which failure rates and reliability coefficients must be recorded. To further complicate matters, this information sometimes must be kept for each of several environments at several levels of assembly. Due to the vast quantity of data and the large number of calculations, it has been necessary to use electronic computer systems which serve the dual function of arranging and sorting the data in proper sequences and computing the failure rates and reliability coefficients. The problem is how to take the vast amount of output data and put it into a form that will be meaningful and useful both to the design engineer and to management. To accomplish this goal the reliability report must be short while at the same time detailed enough to highlight low reliability components and to show progress in improving the reliability of all items of interest. The Master Control System is the ideal tool with which to accomplish this.

ASQC LCS Codes 840:10;60;70:436

This system was initially presented in a company report entitled "Presentation of Reliability Information for Polaris Guidance," by G. Hahn and S. Shapiro

*Paper presented at the New England Conference of the American Society for Quality Control, Albany, N.Y., Oct. 23, 1954, and published in the October, 1955, issue of *Industrial Quality Control*, Vol. VII, No. 4, p. 17

Master Control System Applied to Reliability

The goals of various reliability programs differ in scope and areas of interest with each having its own particular problems. Therefore, the adaptation of the Master Control System will vary from project to project. The illustration used here is concerned with a reliability program for a research and development contract of a complex system. The objectives of the program were as follows:

1. Compute system reliability and evaluate the effect of redesign and modifications on this reliability.
2. Compute subassembly and component* reliability at various levels of test and evaluate the effect of redesigns and modifications.
3. Supply information to design engineers on which components are not meeting the desired reliability.

The above information had to be presented in one report which could readily be understood. The output from the computer would supply the information for the report and would be available to the design or test engineers upon request.

A simplified version of the system is shown in Fig. 1. The adapted Master Control System consists of the following basic parts: The Master Control Sheets, the principle of pyramiding, a criterion for determining significant changes in reliability, and a summary block diagram.

Master Control Sheets

The Master Control Sheet is shown in Fig. 2. The sheet is divided into three areas. The lower left-hand side contains two columns labeled R and R′. The value R is the required reliability for a given unit so that the system will have the specified reliability. This value is calculated at the start of the program

*A component unit is made up of a group of parts; example: gyros, printed wiring boards, motors, resolvers, etc.

and would not be changed unless there were radical design changes.

The value R′ is the actual reliability for a previous period. This period could be the cumulative reliability to date beginning at the time of the start of the chart. Thus R′ would be revised every two to three months at which time a new chart would be started. Entries on the chart could be made on a weekly or monthly basis depending on the volume of data coming in and the urgency of getting the information back to the engineers.

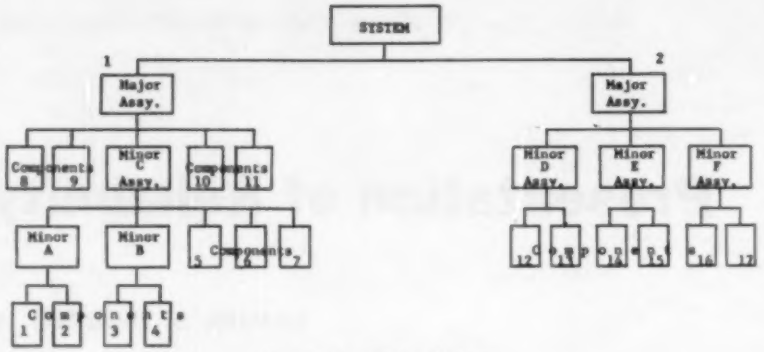


Figure 1—Missile System

To determine R and R′ the product function has generally been used:

$$R_s = \prod_{i=1}^{N} R_i$$

where

R_s is the overall system reliability
R_i is the unit reliability
N is the total number of units in the system, and either the theoretical (R) or actual (R′) reliabilities can be used.

The second section of the chart is the main body. The units of the assembly for which the sheet is being made out are listed in the left-hand column. The name and/or drawing number can be used to identify the unit. The assembly is shown in the top left-hand corner. The product of the reliability for all the units on the sheet represents the reliability of the assembly.* The table is divided into columns for weekly (or any other desired period) entries. In each column there is room to enter the test time (T) for the week and the number of failures (F). A possible alternative is to enter the reliability coefficients or the number of failures.

The third section of the sheet is a graph of the reliability of the assembly. This gives a visual presentation of the trend in reliability for the assembly. Either the reliability coefficient or the failure rate can be plotted here. The reliability goal of the assembly can be drawn on the chart and this will give a quick picture of whether the assembly is meeting its requirements.

The master control sheet for an assembly gives management and engineers the following information quickly and concisely:

1. It shows if the assembly is meeting its reliability criterion
2. If it is not meeting the criterion it indicates which of the units in the assembly are causing the lower than desired reliability
3. The strong and weak units can be easily spotted by comparing R with R′
4. The trend in the reliability, whether increasing, decreasing or constant is shown on the chart

Criteria for Determining Significant Changes in Reliability

Additional information may be obtained from the sheets by means of indicating significant changes in reliability on a week-to-week basis. A significant improvement in reliability is indicated by circling in green the week where the improvement occurred. A red circle is used to indicate a significant decrease in reliability. The circles indicate to the engineers that something unusual has occurred and should be investigated. A circle can be caused by a design change, a decline in the quality of the components used in this period, a change in the manufacturing or assembly procedures, etc. The following rationale was used to set up a test criterion to detect significant changes.

In the illustrated example the test procedures required that each component, assembly, and system go through a defined series of tests. If a failure occurred, the failed item would be replaced and the test continued. Since test time (T) is a fixed parameter, the number of failures X occurring during T is the only random variable. If we now assume that the probability of failure for a particular unit over time is constant, then the number of failures will follow the Poisson Distribution

$$P_r\,(X \text{ Failures}) = \frac{e^{-\lambda T}\,(\lambda T)^X}{X!} \qquad (1)$$

where

λ is the failure rate estimated by $\frac{X}{T}$
X = number of failures
T = test time

then,

$E(X/T) = \lambda$
$\sigma^2(X/T) = \lambda/T$

and using a normal approximation

$$\left| \frac{X_1}{T_1} - \frac{X_2}{T_2} \right| < k \sqrt{\frac{X_1 + X_2}{T_1 + T_2}\left(\frac{1}{T_1} + \frac{1}{T_2}\right)} \qquad (2)$$

is an approximate criterion to use to determine if a significant change has occurred,* where

X_1 = Number of failures for previous period
T_1 = Test time for previous period
X_2 = Number of failures this week
T_2 = Test time this week
k = Normal deviate

This criterion can be simplified if we assume $\lambda_1 = X_1/T_1$ is the standard for the unit and represents the λ of the population. Then to check if the number of failures in any one period represents a

*For series connected systems

*For more exact procedures see "Statistical Methods for Poisson Processes and Exponential Population," A. Birnbaum, *Journal of the American Statistical Association*, Vol. 49, No. 266, June, 1954.

change in the reliability or hence a change in λ_1 with α confidence, we can use a Poisson table to check the probability of getting X_s (number of failures for the period) knowing λ_1 and T_s (the test times for the period). If we are again willing to use a normal approximation we can use the Number Defective Tables which are used in conjunction with the Master Control System.* This table will give the upper and lower limit of the number of failures for which we can accept the hypothesis that $\lambda_1 = \lambda_2$.

The Principle of Pyramiding

In the original concepts of the Master Control System pyramiding referred to the combining of all data from the lowest levels of operation into one chart for the highest level of management. The top step in the pyramiding was the General Manager's chart which contained one entry from each manufacturing superintendent's area. The bottom level chart would show the defects for a given operation.

In the reliability program, the pyramiding is somewhat different. The bottom of the pyramid is the lowest level minor subassembly shown in Fig. 1. The next step in the pyramid is to combine data on several minor assemblies and additional components into a chart of the next highest assembly. The pyramiding is continued until the top chart which shows the system and its two major assemblies. This final chart is shown in Fig. 2.

An advantage of pyramiding is that not all the charts need be sent to one individual. Top management would be interested in the top level charts. A design engineer would be interested only in the assembly he is responsible for. This approach also allows one to study the system piece by piece and evaluate each component and its assembly according to its desired reliability.

The Summary Block Diagram

Once a month, or oftener if desired, a block diagram of the system is published. This diagram would be identical to the one in Fig. 1 and would have in each block the following information:

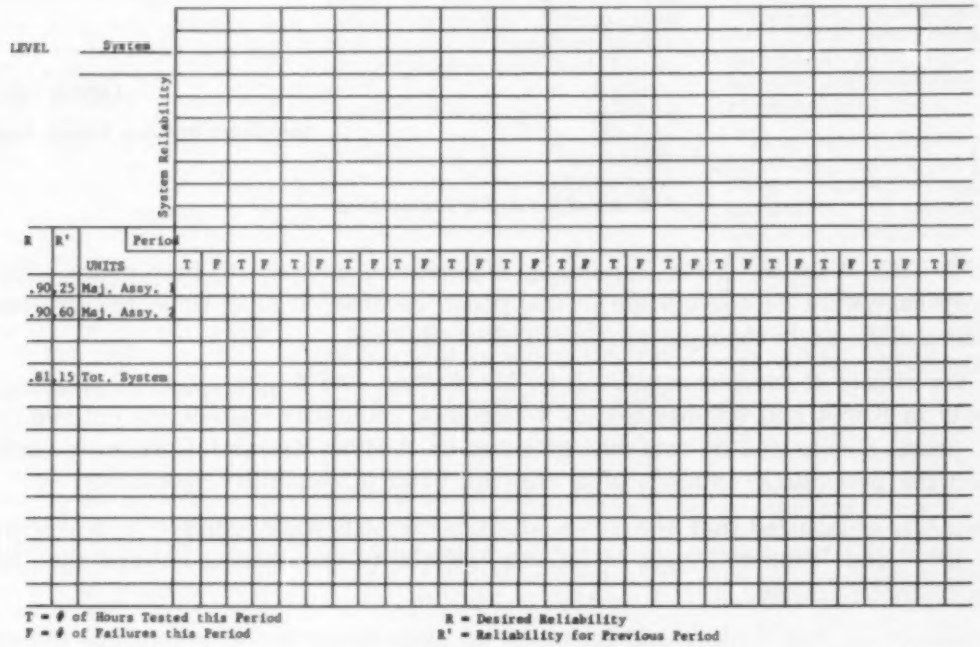
Ra—Reliability of the unit to date

Rb—Lower limit of reliability to date

Rc—Reliability for the past month

Rd—Reliability criterion for unit

Used in this way the diagram summarizes on one sheet of paper the present status of the system. It can be universally circulated and will keep all parties of interest up to date. An asterisk can be used to pinpoint units not meeting their reliability criterion. An alternative to this is to show failures at various levels of assembly.


LEVEL
System
System Reliability
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.90 .25 Maj. Assy. 1
.90 .60 Maj. Assy. 2
.81 .15 Tot. System
T = # of Hours Tested this Period
F = # of Failures this Period
R = Desired Reliability
R' = Reliability for Previous Period

Figure 2—Master Control Sheet

Conclusion

The above system enables the presentation of large quantities of reliability data in a concise, readily understandable form. It highlights the weak and strong areas and shows where significant changes in reliability have occurred. It supplies the manager with the necessary information to locate problem areas and puts at his fingertips the necessary information to direct the design program. It focuses the attention of the design engineer on specific units on which he can request additional reliability information. This alleviates the problem of his spending hours sifting through the vast quantity of information in computer machine language trying to find the information of interest to him.

The Master Control System has simplified presentation procedures in quality control and can do the same thing for reliability.

*Number Defective Table can be obtained from the Mathematical Analysis Section, General Engineering Laboratory, Schenectady, N. Y.

MANAGEMENT POLICIES for assigning departmental reliability responsibilities

LESLIE W. BALL

Aero-Space Division, Boeing Airplane Co.

Status of Reliability Engineering

ABOUT TEN YEARS AGO, reliability engineering entered its first phase. The name *conceptual* would be appropriate to this phase because, at that time, the greatest need was to formulate such concepts as the Product Rule.

After the efforts of the pioneers, such as Mr. Lusser, had drawn attention to the problem and events in Korea had emphasized its importance, reliability engineering entered the "fact finding" phase. Service-failure-rate data gathered by AIRinc, Research Corporation and others confirmed the pessimistic opinions of a growing band of reliability specialists.

When it was recognized that new stress analysis methods were required to deal with the so called "early" and "random" types of failures, reliability engineering entered the "technical methods research" phase.

Now conceptual, fact finding and technical methods research efforts continue to be important but technical knowledge has advanced to a point where the most urgent need is for "management methods research."

We may say that retention of our military superiority depends upon achieving superior reliability in complex weapon systems and that this superiority depends, in turn, upon the ability and dedication with which we attack the problem of reliability management methods research.

Underlying Causes of Unreliability

Mere concepts or even undigested facts are not a satisfactory base for getting management action. To do so, it is necessary to work out a simple but fundamental understanding of the underlying causes of unreliability and to express this understanding in management terms.

The author's choice of underlying causes is based on failure analysis. The results of each analysis have been expressed in tabular form using the following four column titles. (1) Item, (2) Failure Phenomenon, (3) Controllable Employee Error, and (4) Recurrence Control Action. The first column names the part that failed. The second column gives a description in engineering terms of what actually happened. The third column, "Controllable Employee Error," is essential to paving the way for management action to prevent recurrence. The fourth column "Recurrence Control Action," provides an answer to the question, "What specific discipline or practice could management require and enforce to reduce the probability of recurrence of this same type of failure?"

Failure analyses performed in accordance with the above pattern have led to the conclusion that the major underlying causes of reliability are these:

(1) *Variance in Materials and Processes.* Customer demands for extreme performance combined with a national tendency to strive for the novel have led to the use of materials and processes having associated variances that cause myriads of infrequently occurring modes of failure.

(2) *Lack of Organized Knowledge.* Organized knowledge of "normal" modes of failure is available to design, manufacturing and quality engineers in handbook form but knowledge required for prediction, control and measurement of infrequent-

ASQC LCS Codes 810:60;70:400

ly occurring modes of failure is not adequate.

(3) *Breakdown of Management Discipline.* In structural engineering, absolute reliability has been achieved by management enforcement of the disciplines of stress analysis, qualification testing, process control and conformance inspection. In the missile electronics and even in the missile mechanical industry failure analyses show that these disciplines have deteriorated. For example, in the case of electronics, the discipline of stress analysis was hardly recognized until a few years ago.

Because it is not possible to achieve the performance required of missiles without the use of materials and processes that carry with them myriads of infrequently occurring modes of failure, it is not possible to restore absolute reliability. However, it is possible to provide, through reliability research, both the organized knowledge required to predict, control and measure failure rates and the management disciplines required to ensure that the necessary formal procedures are followed.

General Reliability Policy Statement

It is unsatisfactory for the general manager of a missile company to meet a customer demand for a reliability program merely by creating a reliability engineering group. Reliability achievement requires a positive series of actions at all levels of the organization including the general manager himself. This series of actions must not only start at the top but must be generated down with the full weight of line organization authority. Because actions to prevent recurrence of failure are required from the design, purchasing, manufacturing quality and service support organizations, direction must be provided to these departments.

A general manager can discharge his responsibility by issuing a "General Reliability Policy Statement" provided that this statement is specific and comprehensive enough to cover (1) Purpose, (2) Organization, (3) Practices, (4) Personnel and (5) Audit. Each of these items will be discussed in the following sections.

I. Purpose

The general reliability policy statement of purpose should be derived from the above list of underlying causes. The following is a model statement.

> The (insert name of company) will maintain a company-wide reliability program. The purpose of this program is to attain maximum systems effectiveness within available funds by providing organized knowledge and by enforcing effective discipline for prediction, control, measurement and reporting of both normal and infrently occurring modes of failure.

II. Organization

The policy statement on organization should not deal with organization chart details. Such details may result from expediency and be subject to change. It should deal with those aspects of organization that are vitally important to reliability achievement and fundamental enough to have long-term stability. It must define functional responsibilities, but the question, "Who is responsible for reliability?" does not lend itself to a helpful answer. Reliability activities are so widespread throughout an organization that only the general manager can be responsible for all aspects.

Much more useful answers can be generated by asking more specific questions such as: "Who is responsible for reliability research, who is responsible for project reliability management?" The following model general reliability policy statement follows this pattern.

> (a) *Reliability Research and Services.* A reliability director, reporting to the general manager, will be responsible for ensuring that the knowledge, practices and skills required for reliability creation and reliability assurance are developed and made available as needed throughout the organization.
>
> (b) *Project Reliability Management.* For each project for which a reliability program is established, a reliability project manager will be appointed to ensure the coordination and effectiveness of all aspects of the project reliability program.
>
> (c) *Reliability Creation.* The Design Departments are responsible for performing failure-rate stress analyses and for specifying allowable part and assembly failure rates that are compatible with the system reliability requirements. The Purchasing and Manufacturing Departments are responsible for achieving or improving the specified part and assembly failure rates in the production equipments.
>
> (d) *Reliability Assurance.* Design reliability assurance and production reliability assurance groups will be established either within the engineering and quality departments or reporting to the reliability director. These groups will assure adequate documentation of procedures and criteria that are essential to reliability and compliance with these procedures and criteria.

It should be noted that the above statement of policy permits but does not enforce gathering all the reliability research, assurance and project reliability management groups together into one line organization under a reliability director. The essential requirements are (1) that these groups be established and (2) that the reliability director have centralized functional control over them.

Decentralized location and line administration are not incompatible with centralized functional responsibility and control. Figure 1 illustrates this organizational principle.

III. Practices

The reliability program must control the detailed activities of every drawing board designer, buyer, manufacturing floor or bench worker, inspector and service support technician.

There are two major aspects to accomplishing this requirement. First, every activity that affects equipment reliability must be identified and within each activity, required procedures must be catalogued. Table I presents a list of such activities.

This list has evolved from the failure analysis process in answer to the question, "What specific activity or discipline could management require to prevent recurrence of this failure in the future?" In addition, every available Department of Defense specification, policy or contractual requirement for reliability has been checked to ensure that the list of activities was adequate.

The second requirement is that management discipline within the company must provide for a continuum of documented authority from the general reliability policy statement down to the actual operating instructions used by the bench worker. Both the requirement for identification of activities and the continuum of authority are covered in the following model policy statement.

A continuum of management control over reliability practices will be

established and maintained by the following sequence of authoritative documents:

(a) *Reliability Policies Manual.* The Reliability Director will issue and maintain a Reliability Policies Manual that will, (1) identify specific activities essential to achieving the above purpose, (2) provide policy guidance for each activity, (3) define departmental responsibilities for each activity.

(b) *Procedure Guides.* The Reliability Director will identify all the procedures that must be written by each functional department to implement the Policies Manual and will provide a guide for each such procedure.

(c) *Department Reliability Directives, Procedures and Instructions.* Each functional department will issue Department Reliability Directives as required to implement the Reliability Policies Manual and such further Procedures and Operating Instructions as are required to control each practice.

IV. Personnel

During a phase in which the principle job of the reliability engineer is to spread concepts and to gain attention to reliability from his colleagues, reliability groups can be staffed by "generalists." When program implementation reaches the stage of requiring specific activities, staffing by generalists proves to be chronically ineffective. At this stage serious attention must be paid to the specific skills and training required to make reliability engineering personnel effective. One essential objective of this study must be to provide long-term career growth possibilities both for motivation of on-board personnel and for recruiting of new talent.

Table II lists nine types of reliability engineering skill and correlates these skills with the reliability activities list. Again, the brief titles used for the skill groups are subject to misinterpretation unless model position descriptions are provided for each. The scope of this article is to emphasize the extreme importance of having the skill groups well defined rather than to provide the position descriptions.

A model reliability policy statement on personnel is as follows:

> The specialized skills required for implementation of reliability practices will be identified and job categories established. The Reliability Director will ensure the professional adequacy of these skill groups.

V. Audit

Management understanding of reliability program requirements will be aided by recognition that for procurement of high reliability parts and equipment, a traditional relationship between buyer and seller has broken down.

Traditionally, the buyer would write a specification describing the performance characteristics that had to be met and the buyer and seller would agree on a test program that would be satisfactory for demonstration of contract fulfillment. For procurement of high reliability, the principle of specifying a quantitative value is fundamental but its application is not simple. It is complicated partly by the fact that reliability is a growth characteristic and can best be represented by a curve relating reliability to calendar time. The initial reliability that might be measured on the prototype is only one point on this curve. It is complicated further by the fact that, with the exception of electronic equipment for which the requirement is a mean time between failure of less than 100 hours, demonstration by testing alone is prohibitively expensive, time consuming and inconclusive. Even if reliability could be demonstrated by testing with reasonable cost and accuracy, this demonstration often would come so late in a program that by the time that failure to meet the reliability requirement was recognized, the loss of lead time would be catastrophic.

Because the buyer cannot contract for reliability simply by requiring that it be demonstrated by testing, it is absolutely essential that he contract for control and visibility of the reliability that the seller builds into his design, purchasing and manufacturing work.

It is to be expected that the seller's first reaction to demands

Table I—List of Activities Essential to Reliability*

INDEX TO BASIC RELIABILITY PROGRAM TASK PLANS	
A. Reliability Research & Services Task Plan	**Reliability Director**
1. Identify Disciplines, Skills, Policies, Principles & Tasks 2. Develop Organization, Assign Tasks, Assess Suppliers 3. Research Failures, Correlate Criteria & Disciplines 4. Develop Statistical Failure Reporting Methods & Services 5. Communicate by Lectures, Manuals & Basic Reports	Supported by Reliability Research Engineers who may be attached to any organizational unit
B. Reliability Directive Task Plan	**Department Heads**
1. Develop Reliability Program Management Directives 2. Develop Design Reliability Creation Directives 3. Develop Design Reliability Assurance Directives 4. Develop Production Reliability Creation Directives 5. Develop Production Reliability Assurance Directives 6. Develop Use Reliability Assistance Directives	Supported by their Reliability Staffs
INDEX TO PROJECT RELIABILITY PROGRAM TASK PLANS	
C. Reliability Program Management Task Plan	**Program Manager**
1. Negotiate Work Statements, Procedures, Funding 2. Establish Company Plan, Organization & Facilities 3. Establish Supplier Plans, Organization & Facilities 4. Monitor Program Task Status, Issue Progress Reports 5. Monitor Failure Data & Recurrence Control Actions	Supported by his staff of Reliability Program Management Engineers
D. Design Reliability Creation Task Plan	**Project Engineering Head**
1. Study User Requirements, Environments & Personnel 2. Study to Allocate, Predict, Improve & Simplify 3. Set Failure Rates by Part, Circuit & Packaging Selection 4. Prove Failure Rate by Stress Simulation Tests 5. Document Designs for Review, Production & Use 6. Control Failure Recurrence by Design Change	Supported by Design Line Organization & Project Engineering Reliability Group
E. Design Reliability Assurance Task Plan	**Design Assurance Head**
1. Review Procedure Compliance & Decisions Continuously 2. Perform Monitoring Point Design Reviews 3. Review Component Qualification Test Plans & Results 4. Review Systems Test Plans & Results	Supported by Design Assurance, a Project Engineering Reliability Line Organization
F. Production Reliability Creation Task Plan	**Project Production Heads**
1. Document Company Production Variance Controls 2. Document Supplier Production Variance Controls 3. Apply In-process Variance Control Procedures 4. Apply Post-process Variance Control Procedures 5. Control Failure Recurrence by Production Change	Supported by Materiel & Manufacturing Line Organization
G. Production Reliability Assurance Task Plan	**Production Assurance Head**
1. Review Production Control Variance Documentation 2. Monitor Compliance with Control Documentation 3. Inspect for Conformance by Nondestructive Tests 4. Verify Reliability by Environment & MTBF Tests 5. Report Production Failures & Assign Action	Supported by Quality Assurance and Service Support Line Organizations
H. Use Reliability Assistance Task Plan	**Customer Service Head**
1. Review Use Manuals & Their Application 2. Report Use Failures & Assign Action	Supported by Headquarters & Base Organizations

*This listing shows only brief titles that are subject to misinterpretation as to meaning and scope. The author has completed an "Activities Policy Manual" which includes a model policy statement for each activity and a list of applicable principles that are so fundamental that they apply to all types of organization and product. A book now under preparation further elucidates the nature and scope of each of these activities.

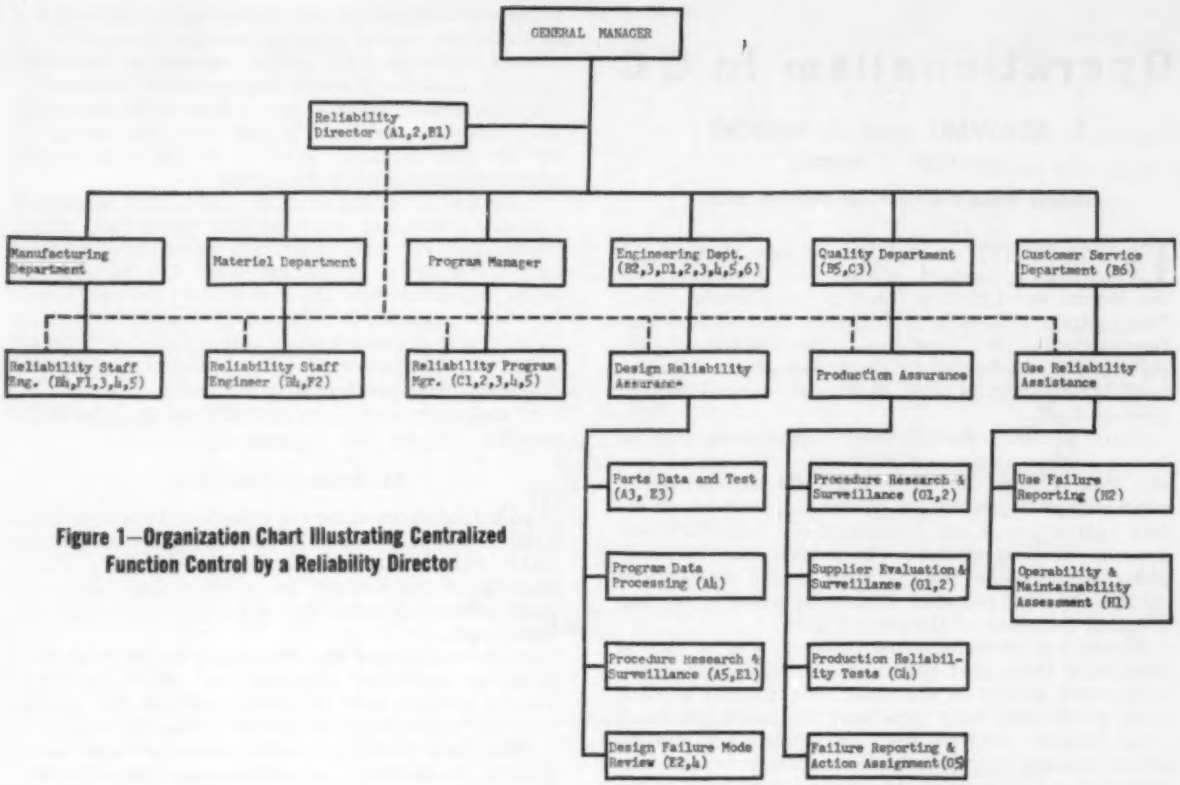


Figure 1—Organization Chart Illustrating Centralized Function Control by a Reliability Director

for extreme visibility of his internal operations will be resentment. This resentment will be increased if the buyer is not clear on just what type of visibility is needed and proposes to use an excessive number of resident buyer engineers. It has been found helpful to convince suppliers that every scrap of information that the buyer is seeking is essential to their own management control over their reliability programs.

Attempts to achieve both management visibility and project control by means of a single "Project Reliability Program Report," covering both the contractor's basic practices and the particular project, have proved to be unsatisfactory. Major improvements are being gained by requiring a "Company Basic Program Report" and a separate "Project Program Plan." The former document summarizes all the policies, practices and experience of the company that are available for application to any project. The second document then can be restricted to a catalog of specific tasks for each of which there is a definite objective, fund allocation and time phasing.

This separation of basic information from specific program plans is covered by the following model general reliability policy statement on audit:

Management visibility of the status of reliability practices, skills and project programs will be provided by:

(a) *Basic Reliability Program Report.* The Reliability Director will issue and maintain a Basic Reliability Program Report. This document will summarize the current status of the procedures, instructions and skill groups required for implementing the Reliability Policies Manual.

(b) *Project Reliability Program Plans.* Each customer requirement for a Project Reliability Program will be met by establishment and execution of a Project Reliability Program Plan. Each such plan will consist of clearly defined tasks prepared in accordance with the Reliability Policy Manual and the Basic Reliability Program Report. Progress reports on each task will be specific.

Table II—Correlation of Reliability Specialist Skill Groups with Activities

Reliability Skill Group	Activities
Failure Discipline Analyst	A1, B1, 2, 3, 4, 5
Materials & Parts Engineer	A2, E3
Reliability Methods Engineer	A4, G5, H2
Reliability Program Manager	A5, E1, 2, 4, G1, 2, H1
Data Processing Engineer	C1, 2, 3, 4, 5
Component Test Engineer	E3
Nondestructive Test Engineer	G3
Environmental Test Engineer	G4
Design Specialists	E2, 4

Summary

This year, 1961, the most urgent aspect of reliability engineering is the need for management methods research and for implementation of these methods as they are developed. Enough work has been done for the reliability engineering profession to offer to management a clear path for constructive action. General managers can fulfill their own responsibilities and provide effective delegation to the next organizational level by issuing a General Reliability Policy Statement covering Purpose, Organization, Practices, Personnel and Audit and by whole-heartedly supporting the implementation of this policy statement after it has been issued.

Operationalism In QC

E. STAWSKI and J. BIRECKI
ADVISOR—J. WEIDIG
Mound Road Engine Plant, Detroit, Mich.

During the 1957 model year, a new method for controlling product quality was introduced at the Mound Road Engine Plant of the Chrysler Corp. This method, known as the "Defect Control System," represented a fresh approach to the problem of furnishing line management a maximum amount of relevant information with a minimum expenditure of time and effort.

Early in 1955, the Chrysler Corporation entered into a highly automated processing of engines, and the Mound Road Engine Plant reflected the latest, most advanced planning in this regard. Automatic in-line gaging was a key feature of the manufacturing process. Probing stations which identified defective parts, and pre-set tooling were added innovations which, although not entirely new to industry, became integral functions of the overall plan.

While the manufacturing process was a radical departure from past practices, the inspection functions were geared to the same conventional procedures which had been practiced for many years. It soon became evident that an inadequacy existed which needed prompt attention. Quality levels fluctuated in a highly unstable manner; long runs of defective work resulted in much repair and scrap. Responsibility for defective work was often difficult to pinpoint. Inspection and production department responsibilities needed defining and clarification.

Most manufacturing people agreed, in the final analysis, that the primary responsibility for producing good quality work is one of their chief functions. It is important, however, not to allow this precept to become the exclusive alibi of service departments whenever poor quality does occur.

A review of current plant practices, both inspection and manufacturing, revealed that the breach which existed between these two functions had to be bridged by more effective communications. The factual had to be separated from the theoretical; the bad habits had to be replaced by good ones; responsibilities had to be clearly defined, readily accepted and stringently enforced; attitudes needed development and unified management support clearly defined.

It was thus that early in 1957 the Quality Engineering function was ushered in.

CHRONIC QUALITY DEVIATION MEMO

NOTICE TO: PROD. FOREMEN _____
GEN'L. FOREMAN _____
SUPT. _____
GEN'L. SUPT. _____
MFG. MGR. _____
QUALITY CONTROL MGR. _____

DATE _____ OPER. _____ MACHINE _____

THIS IS THE _____ CONSECUTIVE CHECK THAT THIS SPECIFICATION HAS BEEN FOUND OUT OF CONTROL AND REPORTED BY THE AREA INSPECTOR

THIS CONDITION HAS NOT BEEN REMEDIED

NATURE OF DEFECT

_____
_____
_____
_____

DATE _____ INSPECT. FOREMAN _____

Figure 2—Chronic Quality Deviation Memo

The Defect Control Chart

To establish an effective means of communication from inspection to manufacturing, the Defect Control Chart, Fig. 1, was originated. It combines the best features of the p-chart, the c-chart data sheet and plant processing sheets into a versatile multi-purpose instrument.

It was recognized that to make a single chart on a series of operations practical, the chart had to be easy to prepare, easy to understand and still provide accurate information on specific causes of trouble.

With these thoughts in mind, the significant operations to be checked were translated into a comprehensive set of inspection instructions. These included the area to be covered, the name and number of the part to be inspected, and the dimensions or characteristics checked. Also listed were the gages used, as well as the tolerances for each dimension. These instructions were arranged in chronological order directly paralleling the sequence of process operations in the area. The number of dimensions to be checked for each operation, the number of parts in each inspection sample, and the frequency of checks completed the inspection instructions.

The Construction of the Chart

Coded symbols have been devised to describe the results of each inspection in the area covered by the chart. As each inspection is completed, a symbol is entered in the block next to the related process operation. If no defects are found, a dash (—) is entered in the appropriate block indicating an "in control" condition. Any defect found is represented by a distinctive symbol shown in the legend in Fig. 1.

The number of individual defects found is indicated by a corresponding number inside the symbol. These symbols are drawn in appropriate colors to provide identification by shifts.

After the patrol inspector completes each round, he summarizes his findings in the proper columns at the top center of the sheet:

1. Month and Day
2. Hour of Day
3. Total Defects found (ΣD_0)
4. Number of Characteristics Checked (D_ϕ)
5. Percent of Defects (p_D). This is obtained by the formula $p_D = \Sigma D_0 / D_\phi$

(D_ϕ remains a constant on each stations chart)

The p_D curve is plotted at the bottom of the chart

ASQC LCS Codes 112;341:70:437

DEFECT CONTROL CHART

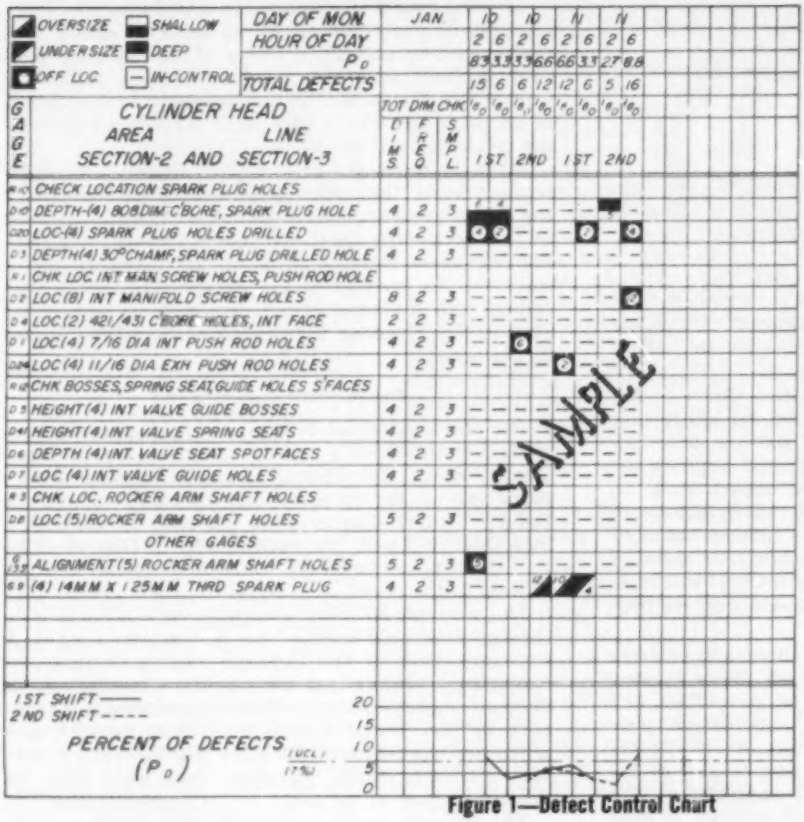

OVERSIZE
UNDERSIZE
OFF LOC
SHALLOW
DEEP
IN-CONTROL
DAY OF MON
HOUR OF DAY
P_0
TOTAL DEFECTS
JAN
10 10 11 11
2 6 2 6 2 6 2 6
8 3 3 3 3 6 6 6 3 3 2 7 8 8
15 6 6 12 12 6 5 16
GAGE
CYLINDER HEAD AREA LINE SECTION-2 AND SECTION-3
TOT DIM CHK
LIMS
FREQ
SMPL
1ST 2ND 1ST 2ND
#10 CHECK LOCATION SPARK PLUG HOLES
D10 DEPTH-(4) BOB DIM C'BORE, SPARK PLUG HOLE 4 2 3
D20 LOC-(4) SPARK PLUG HOLES DRILLED 4 2 3
D 3 DEPTH(4) 30° CHAMF, SPARK PLUG DRILLED HOLE 4 2 3
#1 CHK LOC INT MAN SCREW HOLES, PUSH ROD HOLE
D 2 LOC (8) INT MANIFOLD SCREW HOLES 8 2 3
D 4 LOC (2) 421/431 C'BORE HOLES, INT FACE 2 2 3
D 1 LOC (4) 7/16 DIA INT PUSH ROD HOLES 4 2 3
D24 LOC (4) 11/16 DIA EXH PUSH ROD HOLES 4 2 3
#12 CHK BOSSES, SPRING SEAT, GUIDE HOLES S'FACES
D 5 HEIGHT (4) INT VALVE GUIDE BOSSES 4 2 3
D 4 HEIGHT (4) INT VALVE SPRING SEATS 4 2 3
D 6 DEPTH (4) INT VALVE SEAT SPOTFACES 4 2 3
D 7 LOC (4) INT VALVE GUIDE HOLES 4 2 3
#3 CHK LOC. ROCKER ARM SHAFT HOLES
D 8 LOC (5) ROCKER ARM SHAFT HOLES 5 2 3
OTHER GAGES
#13 ALIGNMENT (5) ROCKER ARM SHAFT HOLES 5 2 3
#9 (4) 14MM X 1.25MM THRD SPARK PLUG 4 2 3
SAMPLE
1ST SHIFT
2ND SHIFT
PERCENT OF DEFECTS (P_0)
UCL (17%)
20
15
10
5
0

Figure 1—Defect Control Chart

1. CHART INFORMATION
- (A) DATE, PART AND NUMBER
- (B) DIM TO BE CHECKED & TOL FOR EACH
- (C) GAGES TO BE USED
- (D) FREQUENCY OF CHECKS
- (E) SAMPLE SIZE FOR EACH INSPECTION INTERVAL
- (F) TOTAL DIMS CHECKED EACH INTERVAL

2 NUMBER OF NON-CONFORMING CHARACTERISTICS
- (G) WHAT THE DISCREPANCIES ARE (DESCRIPTION PER LEGEND)
- (H) FREQUENCY OF OCCURRENCE

3 QUALITY TREND
- (I) PERCENT OF DEFECTS (BOTTOM OF EACH COLUMN)
- (J) COMPARISON BETWEEN SHIFTS
- (K) OVERALL TREND PERFORMANCE (HOURLY, DAILY, WEEKLY)

4 MUCH BETTER CONTROL OF QUALITY
- (L) INSPECTION PERSONNEL MAINTENACE CHART
- (M) SUPERVISION HAS FACTS HOT FROM PRODUCTION LINE
- (N) NON-CONFORMING DIMENSIONAL BEHAVIOR (CHRONIC DEFECTS)
- (O) COMPLETE INSPECTION RESULTS
- (P) SUPERVISION BETTER INFORMED
- (Q) REDUCES ERRONEOUS DECISIONS

MOUND ROAD ENGINE PLANT

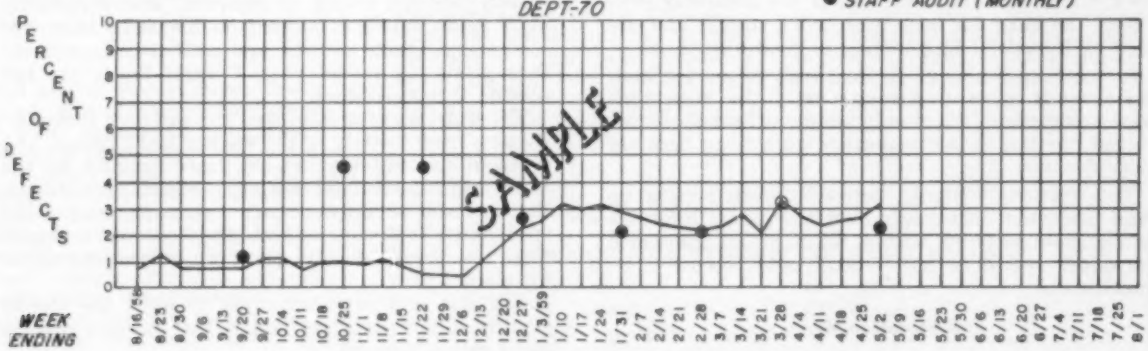
WEEKLY QUALITY LEVEL OF PRODUCTION AS DETERMINED FROM THE USE OF DEFECTS CONTROL CHARTS

QUALITY AUDIT SUMMARY

MOUND ROAD ENGINE PLANT
DIVISION CONTROL CHART FOR
CYL HEAD & CLUTCH HSNGS.
DEPT-70

GEN'L. FOREMAN—J. DOE

—PLANT INSPECTION AUDIT (WEEKLY)
● STAFF AUDIT (MONTHLY)



AREAS OF RESPONSIBILITY FOR CHRONIC OR RECURRENT DEFECTS

Dept. 70 – Foreman	Dept. 70 – Foreman	Dept. 70 – Foreman
CYL. HEAD – LINE #3 – Oper. 20 – Cyl. Blk. joint fact out of squareness 24% Oper. 30 – (5) Cyl. Head Bolt holes (Rocker Arm Post) off loc. 26% (2) Cyl. Head Cover Screw holes off loc. 10% – (4) Exhaust Manifold Stud holes off loc. 7%	CYL. HEAD – LINE #2 – Oper. 30 .562/.563 dia. (4 ream mfg. holes) oversize 13% – .328 dia. (2 oil return holes) off loc. 7% Oper. 40 7/16 dia. (4 push rod holes) off loc. 8% Oper. 50 – (4) Intake Valve Guide holes off loc. 11%	CYL. HEAD – LINE #1 – Oper. 30 .562/.563 dia. (2 ream holes) off loc. 11% – .328 dia. (2 Oil Return holes) off loc. 9% – (5) Rocker Arm Posts (final) off loc. 12% Oper. 40 – .808 C'Bore depth (4 Spark Plug holes) deep 9%

TOTAL DIMENSIONS CHECKED				PERCENT OF DEFECTS			
PERIOD	1ST. SHIFT	2ND. SHIFT	TOTAL	PERIOD	1ST. SHIFT	2 ND. SHIFT	COMBINED
Week Ending 2/12/60	32,690	31,006	63,696		1,113 / 3.4%	942 / 3.0%	2,055 / 3.2%

Figure 3—Quality Audit Summary

QUALITY CONTROL DEPT.

after each patrol. Different colors are used for shift identification.

Control Limits

The average percent of defects (p_D) is determined by the formula:

$$\bar{p}_D = \frac{\Sigma p_D}{N p_D}$$

where Σp_D is the sum of the recorded p_D plottings and Np_D is the total number of plottings. Control limits are established by using the formula:

$$\text{C.L.} = \bar{p}_D \pm 3\sqrt{\bar{p}_D(1 - \bar{p}_D)/D_\theta}$$

Although our quality analysts compute both control limits, floor charts show only the upper control limit. We find this practice avoids confusion on the part of both line operators and inspectors.

In other words, the Defect Control Chart is the "personal diary" of a process in action. Such information helps the production foreman and his subordinates direct their corrective efforts, and support requests for assistance from service departments. In addition, the chart furnishes a detailed history of machine and tool performance. This reduces the need for special process studies when tooling or material changes are made; the Defect Control Chart information is generally sufficient to evaluate process performance.

Some unexpected benefits resulted immediately when charts were being developed. Since gaging methods and frequencies had to be developed, the study revealed gage shortcomings, poor design, poor gage maintenance and process sheet errors. Tolerances which heretofore had not been looked at too closely, were evaluated and made compatible with sound manufacturing practices and product quality requirements.

The charts proved particularly useful in determining work loads for line inspectors since they represented, almost fully, each inspector's job assignment. As a matter of fact, these charts are presently providing the basis for inspection work studies and are used by Industrial Engineering to good advantage.

Instructions are now less frequently misunderstood; the chart is a constant reminder of the inspector's work assignment. Since only simple arithmetic is involved, the use of the inspection work force becomes more flexible.

This feature is highly desirable when setting up rigid inspection manpower quotas. Product information is now visually within reach of all interested personnel and does not depend upon verbal communication.

The Deviation Memo

The second essential part of the Defect Control System is the special report known as the "Deviation Memo," Fig.2. This report or form translates Defect Control Chart information into a written notice to appropriate management personnel advising them that a quality problem exists. It is printed on red paper and provides the following information:

1. Date Issued
2. Area, Operations and Part Involved
3. The Defect Being Reported
4. The Number of Successive Checks on Which This Defect Was Found
5. Name of Issuing Inspection Foreman
6. Name of Receiving Supervisor

Use of the Memo

The first memo is addressed to the production foreman immediately concerned, in order to notify him of the need for corrective action. If the condition persists through several successive checks, follow-up reports are forwarded to progressively higher levels of management. The action taken is recorded in writing on the back of the memo.

When this process reaches the General Superintendent level, the report is presented personally by the Chief Inspector. If the problem remains unsolved at this point, the Quality Control and Manufacturing Managers work together in an effort to find a solution. The purpose of this progressive report procedure is to give the foreman whatever upper echelon support he requires to eliminate quality problems in his area.

The In-Plant Quality Audit

The third principal feature of the Defect Control System is the weekly survey known as the In-Plant Quality Audit. The Quality Control Department prepares this survey by gathering information from all Defect Control Charts. This material is assembled into Quality Audit Summaries, Fig. 3, that describe the quality performance of every manufacturing process in the plant.

The contents of each summary vary according to the organizational level of the person receiving it. A summary sent to the General Superintendent, for example, would reflect the quality situation of his division superintendents. Each superintendent's report, in turn, would discuss the quality performance of his general foreman. In other words, every supervisor's Quality Audit Summary deals only with the quality picture in his own area of responsibility.

The Quality Audit Summary form itself is composed of four sections. The first section, or heading, identifies the member of management and the production area covered in the report. The second contains a percent of defects chart, on which every weekly percent rating is recorded. Every monthly Staff Audit rating is plotted on the same chart for comparison. Both ratings are plotted progressively throughout the model year. Control limits are not used in this application.

The third division identifies the problem that contributes most heavily to the weekly audit rating. The problem descriptions become more specific as the first level of superivision is approached. Accordingly, the General Superintendent's summary assigns responsibility to divisions, while the General Foreman's report is concerned with parts and operations under his control.

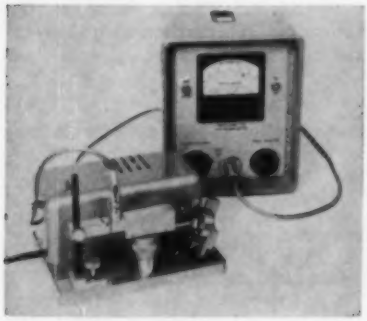
The last section summarizes by shift the Defect Control Chart data on which that week's quality audit rating is based.

Summary

The versatility and adaptability of the Defect Control System has supported its plant-wide application. The development of the system has also made it possible to instruct inspection personnel more effectively and to assign work loads more equally. It has established a higher degree of effective communication among all levels of inspection and production personnel, resulting in improved quality performance. Through its simplicity, the system has gained complete plant acceptance, and the consequent mutual understanding has led to outstanding reductions in quality costs to the plant and to the corporation.

What's New?

ROY A. WYLIE, *Editor*



P-4-2—The Profilometer Type RE Rotary Pilotor provides a means for high production checking of average surface roughness in microinches around surfaces of rotation and across the radii of small parts, both internal and external. Both reciprocating and continuous tracing motion are provided, making the RE Pilotor adaptable to a wide range of parts. Surfaces of rotation or radii from approximately 1/32 inch to approximately two inches or more can be handled easily with this versatile mechanical Pilotor. The selection of any desired arc of trace from 10° to 350°, with automatic reversals, has been provided for by the designers of the Pilotor. The Type RE Pilotor is used in conjunction with a standard Profilometer Amplimeter and Tracer. The amplimeter is sturdy and portable and requires only a 30-second warm-up to put it into operation. Either Arithmetical or R.M.S. Average readings are possible.

* * *

P-4-3—The Wohler Foam Tester is a portable instrument for determining the indentation compression or firmness of rubber latex, urethane and vinyl foams, curled hair and other flexible cushioning materials. A new principle incorporated in the Wohler Foam Tester enables tests to be made through a tiny slit in the foam sample. The slit is nondamaging and is unnoticeable after completion of the test. Results are obtained in regulation ASTM, RMA and SPI units. Originally designed for testing the compression of latex rubber foam having standard cored construction, it has proved to be well suited for testing flexible urethane foams in either slab or cored form. The low friction between metal and urethane foam as contrasted to rubber allows relatively free movement of the mechanism through the foam, making possible accurate indentation compression readings.

* * *

P-4-4—A new torque table for measuring the torque characteristics of hydraulic pumps and motors places no limitation on speed of rotation and features near frictionless performance. No bearings, slip rings, brushes, or similar friction sources are used. The table is a reaction dynomometer, which senses the torque by means of special flexures, to which are affixed bonded strain gages. A specially designed piping system permits accurate torque measurements independent of the flow rate and pressure of the hydraulic supply. Output of the strain gage bridge is compatible with conventional strain gage read-out systems. Models are available in ranges from 50 inch ounces up to thousands of inch pounds.

* * *

P-4-1—Model 4011 Beckman digital voltmeter creates a full 4-digit indication of dc voltages with a linearity of 0.01 percent of full scale. Applied voltages automatically select appropriate range (±10, ±100, ±1000v), polarity sign and decimal point. Sensitivity is better than 1 mv. Repeated measurements average one per second. The Beckman 4011 DVM can be locked into any one of three ranges, to facilitate rapid, repeated measurements. Measurements appear as an in-line, in-plane readout, visible in high ambient light through 150° viewing angle. Readings are also available in 1-2-4-8 binary-coded signals. Printout of measurements on an associated printer may be manually or automatically by an external command signal or adjustable front panel control. All components are arranged in two distinct sub-chassis, which make it possible to package the DVM in either 8 x 8 inch portable rack module or a 5¼ x 19 inch rack mount unit. A self-adjusting stepping switch drive employs sealed relays in place of thyratrons to ensure quiet, smooth operation. Price is $995 for the portable unit, including cabinet; $975 without cabinet.

* * *

P-4-5—A new small hole depth gage developed by Unigage Corporation meets a need for fast, low cost, depth inspection in machine and metalwork manufacturing. It is used for any hole or indentation inspection on parts where depth control is necessary. The gage is direct reading from zero to one-half inch in 0.001 inch graduations. The contact will enter any hole larger than 0.062 inch diameter. The gage is bench mounted, but may be removed from the base and used as a hand gage. The three point support base may be used separately on special gaging applications. It will hold any AGD dial indicator of Groups one through three. The indicator can be locked in any position from vertical to horizontal. Three neoprene feet are used to prevent slippage and to insure a non-rocking non-marring mounting.

* * *

P-4-6—The Rese Model 1300 Magnetic Core Tester is a high speed, multiple output pulse generator that provides programmed, high amplitude current or voltage pulses for laboratory research and development, and for full-scale production testing of high speed magnetic materials, solid state digital devices and computer circuits and systems A flexible, modular system, incorporating a versatile eight step program generator, heavy duty power supplies, and two positive and two

Our Cover

Pushbutton Product Quality Control

A complex "vapor fractometer" (left) determines the ingredient composition of a number of pushbutton products at Johnson's Wax new $1 million pressure package manufacturing and filling plant at Waxdale, Wis.

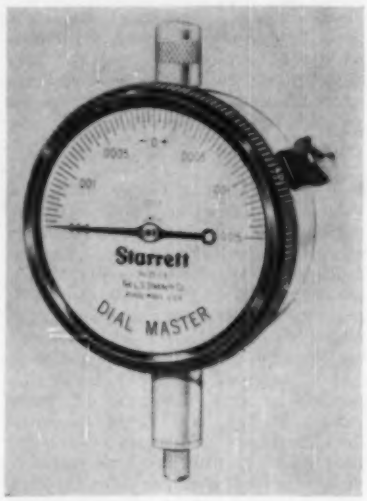
In the photo at right, an inspector scans the pressure cans for the sign of a bubble, since internal pressure, built up by the water's heat, ejects tell-tale bubbles from any leaky cans in the bath. These are plucked out by the spotter.

Speed of the line is more than 200 units a minute, according to Robert P. Gardiner, Johnson's manufacturing vice president. The line is called "the fastest in the nation" by company officials. Most lines in the industry average less than 150 units a minute.

negative output current drivers, the Model 1300 features a 40 nanosecond rise time, 200 kilocycle stepping rates and 2½ ampere current pulses. The versatile pulse programming is based on an eight step, periodically repeated pattern, with both a primary and secondary pulse available at each step. Primary and secondary pulse widths range from 0.5 to 50 microseconds, and secondary pulse delay from 0 to 5 microseconds. Three program modes are available from a front panel switch — Continuous, Step Repeat, and Step-pair Repeat, allowing the program to be stopped at any one or more of its eight steps and made to repeat the scheduled pulse up to 2000 times. Any one or more non-adjacent step-pairs may be repeated up to 1000 times. This feature is particularly valuable for the study of circuit PRF sensitivity, duty-factor effects, core demagnetization and minor hysteresis loop analysis.

* * *

P-4-7—The Askania Dial-Type Extensometer is a mechanical instrument for measuring elongation and stresses on surfaces of metals, plastics, etc. The instrument is totally enclosed in a sheet metal housing and can be safely handled. A hole of approximately ⅛ inch is provided to attach the Extensometer to the object. The distance between two hardened knife edges is 10 mm, but for measuring on larger base elongation, two extension attachments 50 and 100 mm are supplied as standard accessories. The scale of the large pointer has 100 divisions, each corresponding to an elongation of 0.5 microns, which is the direct reading accuracy. Reading accuracy by estimation is 0.05 microns. Each full revolution of the large pointer is 50 microns and as eight full revolutions are possible, the maximum measuring elongation is 400 microns. The instrument is supplied in a case. Price $175.



P-4-8—A new precision dial indicator with accuracy of plus or minus 0.00001 inch has been announced by the L. S. Starrett Co. The #25-106 Dial-Master Dial Indicator is designed for applications requiring extreme precision. Widely spaced graduations read in 0.00005 inches, and the dial reading is 0.0015-0-0.0015 inches, with a total range of 0.003 inches. These super precision dial indicators are furnished with jeweled bearings only.

* * *

P-4-10—Gelman Instrument Company has developed an electronic thermometer to quickly measure surface and internal temperature of frozen foods and meats. This new thermometer gives accurate temperature readings in less than 15 seconds compared to three minutes with mercury thermometers. The unit is hand held and portable and is powered by a standard flashlight battery. The electronic thermometer consists of a probe-cable assembly and the thermometer. The probe is of stainless steel and has a sharp tip for easy insertion in frozen foods. The thermometer part of the instrument indicates temperature directly on a meter. It is calibrated in two ranges: minus 20° to 50°F and 50°F to 120°F. The device works on the principle of measuring the resistance of a heat sensitive nickel coil mounted in the tip of the probe. This tip is thermally isolated from the rest of the probe. The stable resistance element will maintain its calibration over several years. Price of the thermometer complete with carrying case is $178.

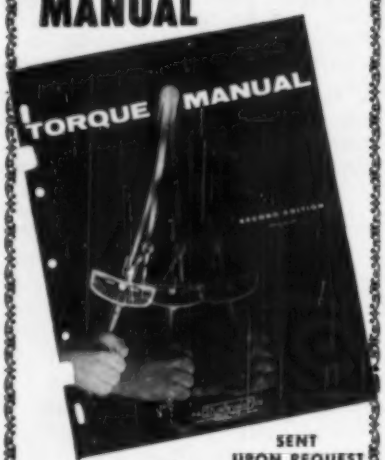
* * *

P-4-11—The Model 6500-T2 Torque Calibrator is a standard for measuring torque and calibrating torque devices. Three scales calibrated in both ounce-inches and gram centimeters provide a measuring range of 0.5 to 40.0 ounce-inches (20-2800 gram centimeters) at an accuracy of ±0.2 percent of indicated reading. Readings of both the device and Torque Calibrator may be compared directly. Widely separated calibration points on the dial provide easy reading on all six bi-directional ranges. The Waters Torque Calibrator, equipped with three accurately calibrated weights, uses the weight-vector principle (no springs). A Certificate of Calibration for each of the three weights is included with each Waters Torque Calibrator. The three weights supplied are 8½ oz., 2 oz., and ½ oz. Used to calibrate Waters Torque Watch Gauges, torque wrenches and torque screwdrivers and other torque measuring equipment, as well as to measure torque where other measuring devices are impractical, the Waters Torque Calibrator checks non-dynamic torque in seconds.

* * *

P-4-12—Many graphical aids have been devised to assist in the preparation and presentation of data in its most concise and intelligible form. At the present time, the accelerating pace of mathematical applications in the technical sciences is introducing new and useful functions constantly. Many of these new functions have immediate and valuable applications in design, test, reliability and quality control engineering. Technical and Engineering Aids for Management provides a service to meet the specialized needs of translating the new functions into useful technical aids in data reduction and evaluation. Assistance is rendered where there are unfulfilled needs for special graph paper, tables, charts or nomographs which can contribute to the more efficient utilization of scientific and engineering personnel. In the case of known specific needs, TEAM can prepare and produce these special aids in finished form. In the event of an incomplete knowledge of a need, TEAM can assist in the development of a satisfactory solution. An example of the special graph paper available is the Extreme Value (Gumbel) Probability Paper. This paper was developed for fitting distributions of extreme values of sets of data and for certain classes of exponential distributions. It has

"TORQUE WRENCH" MANUAL

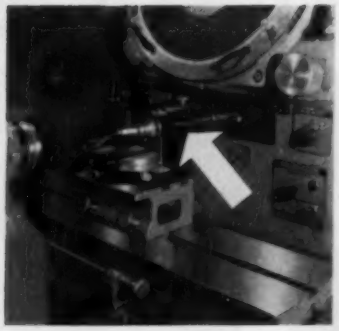


SENT UPON REQUEST

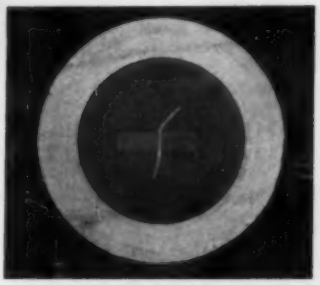
Formulas
Applications
Engineering Data
Screw Torque Data
Adapter Problems
General Principles

P.A. STURTEVANT CO.
ADDISON ILLINOIS QUALITY

Model FC-14 J & L Optical Comparator



CENTRALITE adapter (arrow) slips easily into place on J & L Optical Comparator — used here to inspect tiny read/record head.



CENTRALITE image of read/record head clearly shows two magnetic poles separated by aluminum foil insulator at 31.25 magnifications.

NOW...closer inspection of micro-assemblies

...with CENTRALITE and PARABOLITE

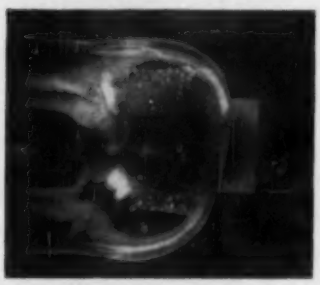
Simply slip on a CENTRALITE or PARABOLITE adapter, and your J & L TC-14 or FC-14 Optical Comparator becomes even *more* versatile. You'll use it for critical inspection jobs that may have previously seemed impossible.

For example, CENTRALITE provides a highly concentrated light which now permits the projection of a precise image of a tiny read/record head used in a computer component. Light is concentrated intensely on the part and reflected back through the J & L projection system onto the Comparator screen. CENTRALITE is also used for micro-inspection of a mesa diode assembly.

PARABOLITE permits detailed examination of a tiny tunnel diode assembly by surrounding it with concentrated light. Simply by rotating the diode, you can take a close look at seal, bubble configuration at fusion points, gold contact to wafer, and other critical details.

Solve *your* inspection problems with J & L Optical Inspection Equipment. Send for Catalog LO-6013 now.

Micro inspection of this mesa diode assembly at 100 magnifications is clearly detailed with CENTRALITE.



PARABOLITE makes possible a sharp close-up of bubble configuration at the fusion point of this tunnel diode (50 magnifications).

JONES & LAMSON MACHINE COMPANY

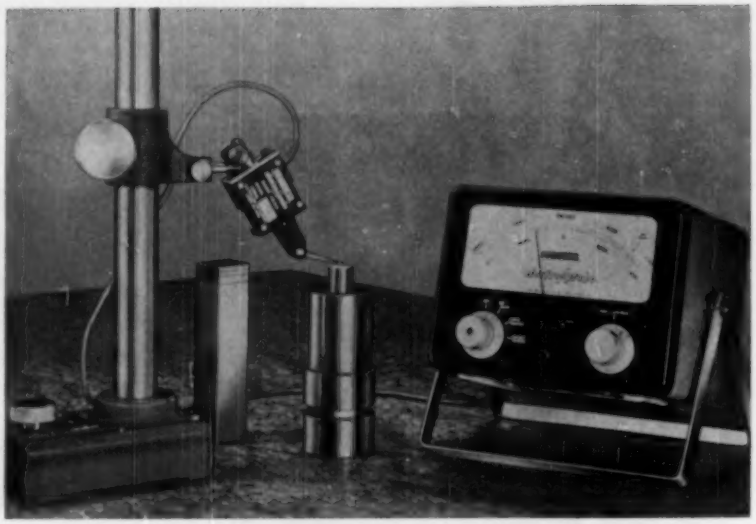
510 Clinton Street, Springfield, Vermont

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

not previously been available on a commercial basis. It is being offered in six combinations. The probability scales on the horizontal axis are 0.0001 to 0.9999 and 0.000001 to 0.999999. The vertical axes are available in a choice of rectangular, three cycle and five cycle logarithmic scales.

* * *

P-4-13—Rapid, direct-calibration of high-accuracy AC measuring instruments is a major application of the new Model 601A Kin Tel AC Voltage Standard. The 601A is an extremely stable and accurate AC voltage source and its calibration capacity greatly simplifies instrument calibration. Other important uses include gyro and servo system design and testing, evaluation of magnetic properties and many other general purpose applications in electronic laboratories or calibration facilities. Key features of the Kin Tel 601A include its ability to supply from one to 501 volts; 60, 400, 1000 cps output frequencies; voltage accuracy to 0.1 percent; short term voltage stability of 0.01 percent; frequency accuracy of 1.0 percent; less than 0.3 percent harmonic distortion, and power output five amps to five volts, 25 watts above five volts.



P-4-9—A new, improved Electronic Gaging Unit, known as the Electro-Probe, has been announced by Federal Products Corp., Providence, R.I. Basic components are a small versatile gage head and light-weight, all transistor amplifier-meter, which is battery operated. The use of transistors and battery power provides high reliability and instant operation without need for warm-up time usually required by Precision electronic equipment. The Electro-Probe is normally powered by a mercury cell battery pack, which provides over 1200 hours of continuous or intermittent operation. Optionally,

(Please turn to page 30)

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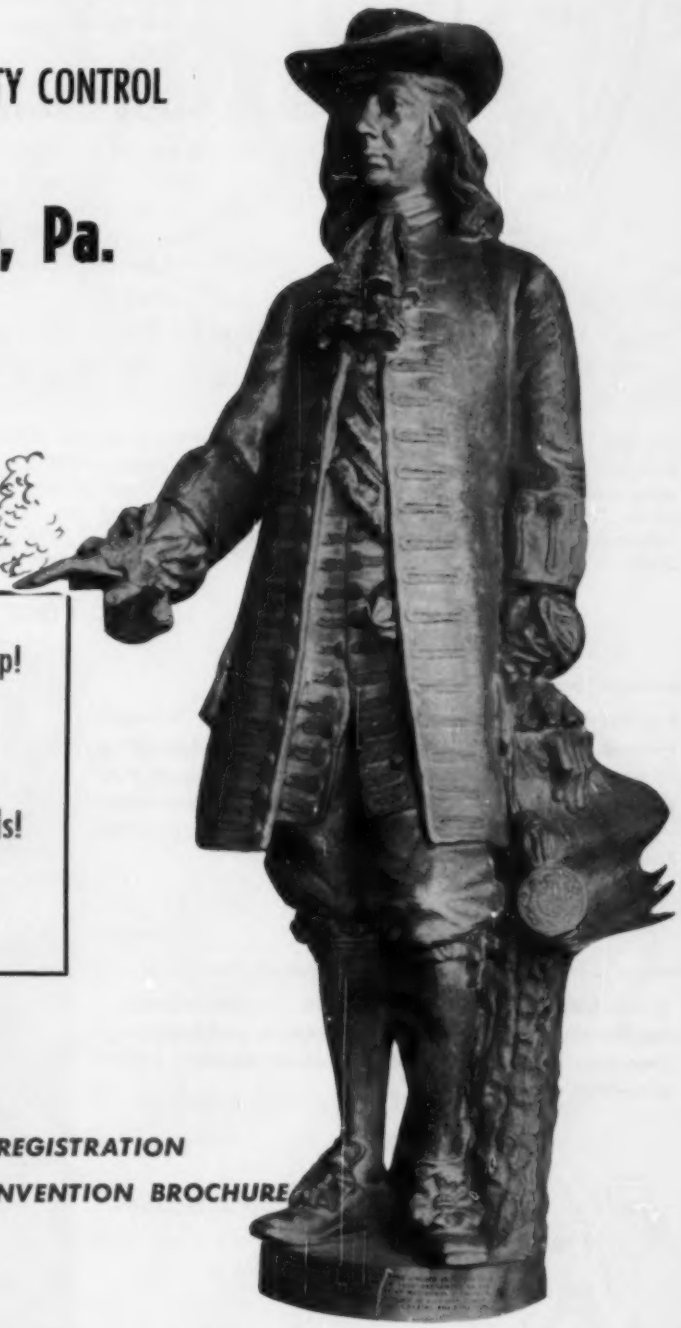
15th annual CONVENTION AND EXHIBIT

AMERICAN SOCIETY FOR QUALITY CONTROL

SHERATON HOTEL

Philadelphia, Pa.



Inspectioneering Workshop!

Exhibits! Plant Tours!

56 Tech Sessions! 6 Panels!

Sights of Philadelphia!

JUNE 5,6,7

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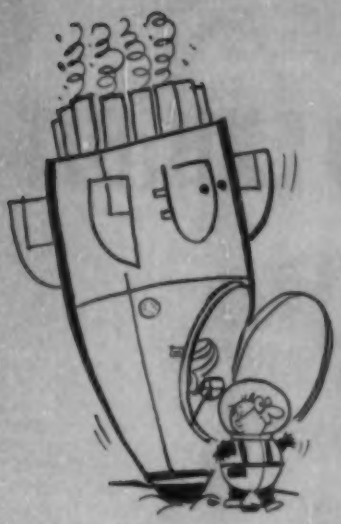
. . . It's QC in the Quaker City in 1961!



UPON YOUR ARRIVAL

A Reception Sunday, June 4, 8 p.m.

A chance to renew old friendships before the hustle and bustle of the Convention.

Social Evening Monday, June 5, 9 p.m.

A NIGHT IN OLDE PHILADELPHIA, the theme of the social, will recreate life as it was then—except that you will be there to use the two refreshment stubs attached to your ticket. After that, you will be on your own. The spirit of brotherly love will be the order of the evening.

You Will Want to Attend The Three General Sessions . . . From 9 to 10 Each Morning

Welcome, Annual Meeting and Sadderis Award Presentation

Monday, June 5, the opening assembly of the Convention. Jules Mehalek, general chairman of the Convention Committee, will present the Welcoming Address. This will be followed by the Annual Meeting of the Society and the Sadderis Award presentation.

Executive Session

Tuesday, June 6, featuring the President of Standard Pressed Steel, Mr. H. Thomas Hallowell, Jr. Regardless of your level in the quality control organization of your company, you won't want to miss business management's viewpoint as Mr. Hallowell talks about "Quality Control, Reliability and Waste."

Honors Convocation

Wednesday, June 7, to honor those persons selected as the Shewhart Medalist, Edwards Medalist, and Brumbaugh Awardee. The address of the Shewhart Medalist will be presented at this session.

Your Convention Headquarters

Your Host Committee Welcomes You

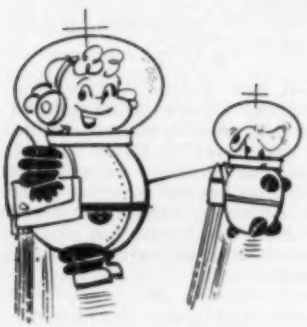
LET THIS PHILADELPHIA Section Host Committee show you the most wonderful time in the 15-year Convention history of your ASQC! Standing, from the left, are Kenneth Stephens, August Mundel, Ken Gray, Ralph Reeves, Andrew Irvine and Stan Hart. Seated are Jerry Braverman, Stan Wirtschafter, Mary Greiner, Julius Mehalek, Mary Wolcott and Thomas Moran.

To the 15th Annual Convention & Exhibit

AMERICAN SOCIETY FOR QUALITY CONTROL

There'll be a Program for the Ladies, Too!

For the Ladies who will be attending the Convention with their Husbands, the following excellent program has been prepared by the Committee.



MONDAY, JUNE 5

10:00 a. m. Coffee Hour—Informal talk by Bonnie Small, Western Electric Co., Allentown, Pa., on the topic "Quality Control and Your Husband."

1:30 p. m. Walking Tour—Historic Philadelphia.

TUESDAY, JUNE 6

10:00 a. m. Coffee Hour

12:00 noon Luncheon and Fashion Show by the Lillian Albus Shop.

1:30 p. m. Walking Tour—Philadelphia's leading shops and stores.

WEDNESDAY, JUNE 7

10:00 a. m. Coffee Hour and Walking Tour—Antique Shops along Antique Row.

At the Sheraton Hotel • Philadelphia • June 5, 6, 7!

New micrometer can measure internal lands and grooves to ± .0005" ...on the machine!

Now, for the first time, you can measure internal lands and grooves, O-ring widths, retaining ring grooves, keyways, and cylinder grooves simply *and accurately.* The new Multi-Mike* internal groove micrometer operates just like any conventional micrometer. Easy-to-read Starrett micrometer head has graduations in thousandths of an inch. Multi-Mike can reach into, and measure, bores as deep as 5¾"; the two standard models fit holes down to ½" or ¼" diameters. The Multi-Mike measures groove widths from .050" to 1.050" and lands from 0 to 1.000". And this amazing new internal micrometer can do all this while the piece is still on the machine!

Multi-Mike produces higher quality work with lower cost set-ups and fewer rejections... gives you greatly reduced inspection and quality control costs. Write today for free literature.

*TRADEMARK; PATENT PENDING

Multi-Mike Micrometer is another invention marketed by:

NAVAN

PRECISION MARKETING NATIONAL SALES

NAVAN PRODUCTS INC.
Subsidiary of
North American Aviation, Inc.
900/N North Sepulveda
El Segundo, California

the user can power the unit with individual mercury cells or carbon cells or operate it from regular power lines. All components, including gage head, battery and accessories are contained within the housing of the amplifier, which is the carrying case of the gage. Carrying handles also serve as adjustable legs so the meter can be set at any angle for easiest viewing. Any two of six different gaging ranges, from 0.0002 to 0.010 inches, can be combined in the amplifier-meter, providing magnifications up to 11,000x. Scales are correlated and provide minimum graduations from 0.000010 to 0.0005 inches depending on the two scales selected. New design of contact tip automatically compensates for setting contact arm at any angle up to 20° with work, thus eliminating the need to apply correction factors as normally required. A new two-speed control for setting zero electrically combines rapid long-range approach and closely controlled fine adjustment. Gage Head operates virtually without friction, applying only 2.5 grams pressure to the work, thus permitting accurate, high-magnification measurements using regular type height gage and test set fixtures. Gage Head and Cord are impervious to oil and water in any amount. Total weight of Electro-Probe is only 6½ lbs.

New Literature Available

L-4-1—Nondestructive Testing Bulletin 00-105 is a 12-page bulletin describing the Sperry line of ultrasonic testing equipment, portable industrial X-ray and Magnetic Particle inspection equipment and supplies.

* * *

L-4-2—A 100-page application note presenting basic information on microwave measurements is now available from the Hewlett-Packard Co. The note, in booklet form, is entitled "Introduction to Microwave Measurements." It is particularly useful to those who must regularly introduce new technical personnel into the specialized field of microwave measurements.

* * *

L-4-3—A booklet describing the theory and design of the recently announced solid state optical maser is now available from Bell Telephone Laboratories. The eight-page booklet is a reprint of an article by A. L. Schawlow of the Laboratories' research department, which appeared originally in the Bell Laboratories Record.

* * *

L-4-4—Screw-Thread Standards for Federal Services, 1957, Part III, National Bureau of Standards Handbook H28 (1957) — Amends in part H28 (1944) (and in part its 1950 Supplement) — was issued October, 1960. This volume is the third of a series of three into which the 1957 edition of NBS Handbook H28 is divided. It covers Acme, Stub Acme, and Buttress threads; rolled threads for screw shells of electric lamp holders and unassembled lamp bases; microscope objective and nosepiece threads; surveying instrument mounting threads; ISO metric thread; miscellaneous threads; Class five interference-fit threads, trial standard; and wrench openings. Price 60 cents. Order direct from Superintendent of Documents, U.S. Government Printing Office, Washington 5, D.C.

* * *

L-4-5—Thwing - Albert's Bulletin #373-ST describing the Fotosize Liquid Penetration Tester for sizing of paper is available. The bulletin illustrates the photoelectric Fotosize Tester and describes the operation of the instrument.

* * *

L-4-6—Magnetic Analysis Corporation has prepared a four-page bulletin #130 describing their new Single Frequency non-destructive inspection equipment for finding flaws in non-ferrous, non-magnetic metals. The bulletin describes how the equipment locates surface or subsurface flaws, in materials up to three inches in diameter, and indicates them on an oscilloscope screen. The bulletin also provides information on the components of the equipment, sensitivity and adaptability to either a separate inspection set-up or production line use.

* * *

L-4-7—Wavelength calibrators for infrared spectrophotometers are being offered at no cost by the Scientific and Process Instruments Division of Beckman Instruments, Inc. A polystyrene film in one end of the calibrator may be inserted into the sample compartment of most infrared spectrophotometers. By comparing the spectral curve produced by the film with a polystyrene curve printed on the back of the calibrator, the operator is able to check the instrument for calibration, resolution, and stray light.

* * *

L-4-8—A new brochure, Successful Supervision, is now being offered without charge to business and industry executives by Elliott Service Co., Inc. The brochure describes 34 booklets that present practical techniques of problem handling in seven major areas, six motivation studies, six boss-to-boss dialogues, and six databooks.

* * *

L-4-9—An eight-page brochure describes a new electronic system of searching metallurgical and related literature for specific information on subjects developed by American Society for Metals. It describes a mechanized way to reduce research costs and increase accuracy, speed and effectiveness. It shows how subscribers may receive, every two weeks, information on anything published in the preceding two weeks on their field of interest.

BOOK REVIEWS

W. D. Baten, Editor
26 University Drive, East Lansing, Mich.

STATISTICS: WITH APPLICATIONS IN MANAGEMENT AND ECONOMICS by Earl K. Bowen. Published by Richard Irwin, Inc., pp. vii-415, $6.50. Reviewed by Dr. Frank Saidel, Mathematics Department, City College, New York, N.Y.

This is a basic text for a first course in Statistics for economics and industrial management students as well as for the general business administration student.

While no prerequisite mathematics is indicated, a general facility with numerical computations is essential. Significant digits and computations with approximate numbers are explained in a chapter on basic calculations which prepares one for many of the calculations encountered in descriptive statistics, including ratios and percent. A brief but basic discussion of logarithms and the use of the slide rule as a computer is also included.

The overall approach is non-mathematical, featuring an illustrative problem centered approach. Despite this limited use of mathematics, the student who works through this book will build a firm foundation for further statistical studies while gaining basic grasp of important statistical ideas.

Each chapter includes a generous selection of problems and nearly all include a large number of true-false questions. An important feature of the book is the bibliography at the end of most chapters, which enables the more inquisitive student to pursue a topic further. Applications are up to date and practical, for instance the description of the use of punched cards in electronic data processing.

A chapter on data collection includes agencies which collect and publish data as well as methods employed in the collection and tabulating process. The construction of charts and statistical tables is explained. A basic understanding of averages and dispersion is aimed for together with a sharp warning on interpretation of numerical results.

Primary sources are referred to, in particular in the discussion of how to compute index numbers and where to find this data. Also in time series analysis in which the National Bureau of Economic Research procedure for dealing with cyclical movements is detailed.

The author makes the greatest use of mathematical procedures in handling regression analysis, the least squares methods for estimating equations of the straight line and of logarithmic equations, including formulas for the standard error of estimate and correlation coefficient.

Sampling is covered in the last four chapters of the book. The non-mathematical exposition of sampling inspection leads to an explanation, via illustrative problems, of the Acceptable Quality Level plan and operating characteristics curve together with double and sequential plans. The computation of points on the operating characteristic curve is clearly explained in an elementary fashion. Practical suggestions are given in connection with sampling procedures.

In keeping with the idea of limiting the level of mathematics required for understanding this book, the normal distribution is approached by the study of the isosceles distribution. Application of normal probabilities are then explained without mathematical derivations. By example, the author shows how to apply the standard error of the mean in the sampling distribution of the mean, and confidence intervals for the universe mean are described in proper technical terms, together with the comparable study of a proportion. Quality control charts are explained in the concluding pages of the book.

There are tables of logarithms, square roots, and areas and ordinates of the normal probability distribution. The 415 page book contains 371 problems and 413 true-false questions. Answers to problems are not given.

A HISTORY OF THE INTERNATIONAL STATISTICAL INSTITUTE: 1885-1960, by J. W. Nixon, International Statistical Institute, The Hague, 1960, pages viii-188, $2.40. Reviewed by Leo Katz, Department of Statistics, Michigan State University.

The year 1960 marked the seventy-fifth anniversary of the founding of the International Statistical Institute. Although a previous volume commemorating the first fifty years of the Institute *(50 annees de l'Institut International de Statistique* by Frederick Zahn) had been issued in 1934, it was decided that the present volume should be as complete as possible and cover the entire seventy-five year span. In large measure, this volume includes the ground covered by the earlier book. However, certain purely historical material is not repeated, for example, biographical notes of the presidents appear only for the five most recent presidents.

Part I covers the development of the Institute from its beginnings through 1946. Part II discussed the

Northeast Reliability Training Course

The Northeast Reliability Training Course will be conducted May 22-27 at the Sheraton Inn, Syracuse, N.Y. It will be directed by foremost consultants in quality control and reliability.

The course will be sponsored by the Electronics Division, ASQC, and the Institute of Radio Engineers.

Classes will total 50 hours, from 9 a.m. Monday, May 22, until 4 p.m. Saturday, May 27. In the evenings guest speakers will lead discussions on various aspects of reliability.

Registration is limited to 35 persons to preserve an atmosphere of individual tutorship. Registration is open to all applicants and is complete only upon the receipt of the full registration fee, $225, which will cover the cost of course materials, lunches and one dinner. The registrar—Mrs. N. J. McAfee, 2106 Tucker Lane, Apt. A-8, Baltimore 7, Md.

Companies sending representatives to this course will benefit directly. Completion of this course will equip the individual with the basic tools and knowledge required to pursue a systematic approach to reliability problems and to up-grade the reliability jobs in his company.

reorganization of the Institute after World War II and its subsequent development up to the present date. In Part III, there is a treatment of the scientific and educational work of the Institute and Part IV discusses the extent to which the aims of the Institute have been met and prospects for future developments.

Seven appendices present the bulk of the historical material. Two dozen illustrations include ten photographs of the successive presidents of the Institute.

SYMBOLS, DEFINITIONS AND TABLES for Industrial Statistics and Quality Control, published by the Rochester Institute of Technology, pages i-202, $3.00. Reviewed by W. D. Baten, Michigan State University. This handbook is available from the Rochester Institute Bookstore, Rochester Institute of Technology, Rochester 8, N.Y.

In 1953 the Industrial Statistical Committee was established to serve as a place to present problems that might be of general interest, to serve as a clearing house for the latest statistical techniques, to serve as a place to inter-change statistical tables and to coordinate the statistical terminology used by various groups.

To carry out the last aim, a Nomenclature Subcommittee was established in 1954 to draw up a set of standard statistical definitions and symbols which could be recommended for wide use. This book contains the report of this subcommittee which was made after several meetings, many conferences with prominent statisticians and detailed study of all recommendations.

The report presents symbols, definitions, descriptions, usages, tests, tables, charts, formulas, outlines, designs, etc., that teachers, personnel in industries and governments, consultants and research workers can use effectively. There is a wide range of statistical nomenclature that should provide for reports, surveys, analyses, etc. a common language that will be understood by a large number of people. If all beginning statistical text books, courses of instruction in statistics and many articles in our statistical journals would use the recommendations included in this report there would be, in a few years, less confusion on the uses of statistical material than at present and more uniformity as to explaining statistical procedures.

This book presents material about measures of central tendency, measures of dispersion, errors, terms about attributes, acceptance sampling, significance tests, analyses of variances, control charts, confidence limits, various distributions and their 5 percent and 1 percent probability points, power of tests, estimation, linear and multiple regression, correlations, designs of experiments, etc.

There are many tables such as X^2, t, F, confidence limits for fraction defectives, random numbers, the normal curve, critical values of the multivariate T^2 distribution, number of observations for t-tests of difference between two arithmetic averages, factors for computing control chart limits, G test for sample means versus standard critical values, confidence limits for correlation coefficients, number of observations required for the comparison of two population variances using the F-test, charts of the power function for analysis of variance tests, etc.

Every statistician will find this book a valuable addition to his library.

EFFECTIVE WORK MANAGEMENT by Milton Brown, MacMillan Co., New York City, 12 Chapters, 244 pages, $5.00. Reviewed by W. J. Gallagher, Chrysler Corp., John R. plant, Detroit, Mich.

As the title indicates, this book is directed to all areas of management. Considered from a quality control orientation it can be excellent reading for not only management, but also the quality control engineer and analyst.

The book is organized into five major areas beginning with a discussion of precisely what a manager does. Succeeding sections cover Planning and Decision Making, Executive Action, Management Control and Applying the Management Process...

Chapter 11 provides a series of worthwhile check lists to improve work methods and efficiency, utilization of manpower and other elements all essential for a successful total quality control program. The discussion on Making Sound Decisions may basically be the scientific approach. However, the straightforward presentation is laid out in a manner which will induce the reader to frequently refer back to the text, much in the way that you would use a handbook.

So much has been written on the mathematical techniques of quality control, we sometimes forget that these tools, important as they are, represent only one phase of the quality control function. This book is an excellent *sine qua non* to go with the necessary mathematics if the quality control technician is to be adequately equipped to do his job.

Effective Work Management can be highly recommended for the technically oriented quality control specialist to round out his background and enable him to significantly increase his effectiveness.

Case Histories On Statistical Methods For Quality Control

Series II *(Regression, Correlation and Association)*

$1.00

Prepared by the Metals Technical Committee of the American Society for Quality Control

Published in April 1960 by the American Iron and Steel Institute

This second series of case histories features the use of committee Standard Data. By keeping data constant, the study is focused on comparison of methods.

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Milwaukee 3, Wis.

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Dean Hund, librarian, RCA; Dr. Paul Leatherman, AMC Ballistic Missile Center, and Don Andree, RCA, discuss the details for donating documents to the library and for withdrawing and returning documents to the libarary.

Los Angeles Section Establishes Quality Control Lending Library

Have you ever wanted to re-read an article on Quality Control only to discover you had discarded the magazine? If so, you have company!

For the past year and a half Jack Lancaster, Ray Primmer and several other members of the Los Angeles section, ASQC, have discussed the desirability of establishing a library of Quality and Reliability so that worthwhile information would not be lost forever the moment it hit the wastebasket.

Problems to be surmounted were—where will the library be located? Who will supply the file cabinets, shelves, etc. for document storage? And most important, who will provide the librarian service, such as card cataloguing, filing, answering requests, etc.?

A search of several months was ended recently when RCA volunteered to provide physical facilities plus librarian service at the RCA Plant in Van Nuys, Calif.

Tentative rules are that any member of LA ASQC may request documents directly from the library by phoning or writing Dean Hund. Non-members or members outside the Los Angeles area must send their request to the Los Angeles section chairman, Jack Lancaster. Due to security problems, it is not practical for outsiders to visit the library, but documents may be picked up at the RCA Lobby. Alternatively they will be received by mail. Reproductions of short articles will be available. These need not be returned but lengthy items will be charged out for two weeks (renewable).

Thanks to Dr. Paul Leatherman, the library already has a complete set of "Industrial Quality Control" plus a few other documents. Additional donations will be gratefully accepted and should be directed to RCA, 8500 Balboa Blvd., Van Nuys, Calif., Attn: Dean Hund. It is important that they be identified as donations to the *ASQC* Library.

As an interesting sidelight, the first request for information from the library did not come from Los Angeles, nor from California, nor from the USA, but from Lausanne, Switzerland. A Consulting Engineer who recently had moved from Los Angeles to Lausanne requested information on Quality Control in Instrument Manufacture for use in preparation of a paper on this subject. Due to difficulty in obtaining the information locally, he sent a request for help to Los Angeles, which was promptly filled.

section briefs

AKRON-CANTON . . . Jan. 12, Dr. John E. Whitwell, Princeton University, addressed a joint meeting with AICE in January . . . His topic, "Evolutionary Operation," which included the Park Analysis Technique, was well received by both groups . . .

Apr. 28, 8:15 a.m., Third Annual Seminar, Akron University . . .

Leonard Seder, author, lecturer and QC consultant, will conduct the morning sessions. Paul Belcher, First National Bank, Akron, the luncheon speaker, will discuss "The Economic Outlook."

The afternoon will be devoted to four concurrently scheduled sessions—"Advanced Statistical Techniques," Dr. Edgar P. King, Eli Lilly Co.; "Starting a QC Program for Small Companies," Edward Braybant, Blackhawk Manufacturing Co.; "Reliability," R. R. Landers and L. F. Moe, Thompson-Ramo-Wooldridge, and "Basic Training in QC," Robert Archer, Hoover Co.

Seminar co-chairmen are Norton Miller, Goodyear Tire & Rubber Co., and Tom Sharkey, Akron University.

H. P. Pierce

ALLENTOWN-BETHLEHEM . . . Jan. 18, Hotel Traylor, pre-meeting clinic—Miss Bonnie Small explained and illustrated several simple though very effective ways of controlling the quality of short runs by statistical methods . . . William A. MacCrehan, Bendix Corp., Baltimore, Md., presented "Challenge of Reliability" . . .

David F. Roberts

BALTIMORE . . . Jan. 17, Robert W. Williams, senior test planning engineer, Air Arm Division, Westinghouse Electric Corp., Baltimore, Md., discussed the need for testing and the details required to implement and accomplish a successful test program . . .

The Baltimore section along with other engineering societies in the area participated in the publication of a National Engineers' Week supplement in one of the local newspapers. One of our past chairmen, Ed Glocker, was a member of the Engineers' Week committee.

At a recent executive committee meeting attention was focused on planning a program for the 1961-62 season. High on the agenda is a proposed Baltimore-Washington Conference on Reliability.

A. M. Reek

BATTLE CREEK-KALAMAZOO . . . Jan. 19, Technical Session, Upjohn Co., Kalamazoo, Mich., with "Search for Reliability" by Nelson G. Meagley, QC department, Continental Aviation and Engineering . . . Mr. Meagley pointed out the importance of the constant search for

better reliability and the high cost of failure, especially in the aircraft and missile industry . . .

Apr. 20, Technical Session, Post Club House, Battle Creek, Mich., with "The Purchasing Viewpoint of QC" by Earl H. Nelson, director of purchasing, Checker Motors Corp., Kalamazoo, Mich. . . . Mr. Nelson is past president of Kalamazoo Valley Association of Purchasing Agents and past national director of National Association of Purchasing Agents . . .

Peter F. Koetz

BIRMINGHAM . . . Jan. 13, meeting held at Tuscaloosa, Professor Paul Hassell, University of Alabama, spoke on "QC Probability Applications" . . . There was a lively discussion on work-sampling . . .

A. E. Raeuber

BOSTON . . . Jan. 9, the eight-week series on Precision Measurement and Gaging opened with 82 registrants . . . Included in this series was the DoALL Company lecture—"Story of the Cutting Edge." This was presented at a dinner meeting . . .

Jan. 12, Bruce W. Atchinson Jr., plant manager, Stanley Tools, New Britain, Conn., held the complete attention of 100 persons during his talk on "What Does the Production Manager Expect from Quality Control" . . .

Apr. 13, "Interpreting Results from Testing Processes" by Dr. Grant Wernimont, Eastman Kodak Co., Rochester, N.Y. . . .

Apr. 6, Merrimac Valley subsection, "Controlling Quality" by Leonard Seder, QC Consultant . . .

This subsection is making formal application for section status. This will be the fifth subsection to be guided to maturity by the Boston section.

H. L. Keefe

William D. Kelley

The life of William D. Kelley, 36, Technical Director of the Allegany Instrument Co., and member of the Delaware Section, ASQC, was tragically ended Feb. 2, when his plane struck a mountain peak in Northern Utah during a sudden snowstorm. The fatal crash occurred while Mr. Kelley was piloting a Cessna 195 to Brigham City, after attending a meeting of the American Rocket Society in Salt Lake City.

Mr. Kelley, a graduate of Virginia Polytechnic Institute, 1950, had achieved notable professional recognition during his fifteen years in the field of rocket instrumentation. A native of Bluefield, W. Va., he began his civilian career with the Hercules Powder Co., Radford, Va., successfully filling a variety of engineering positions. After several years, he left to join the Thiokol Chemical Corp., Elkton, Md., and later was transferred to Brigham City, Utah, where as quality control manager, he led a 750-man instrumentation team, which played an important role in developing the first-stage engine of the Minuteman missile.

After a fourteen-month return with Hercules at Wilmington, Del., as a member of the Programs and Planning Department, Mr. Kelley joined the Allegany Instrument Company as technical director, a staff assignment to the general manager. He assumed this position in September, 1960, and was headquartered in Cumberland, Md., where he resided with his wife and six children.

BUFFALO . . . Jan. 30, Westbrook Hotel, Buffalo, N.Y., 61 persons heard "Machine and Process Capabilities" by William Myers, QC director, Delco Appliances Division, GMC, Rochester, N. Y. . . . A graduate of Indiana Business School of Accounting, Mr. Myers has also completed QC courses at Purdue University and the Rochester Institute of Technology . . . During his 33 years with General Motors he has been a customer contact representative, tool and gage inspection foreman, inspection supervisor, assistant chief inspector, and is presently QC director . . .

A. J. Ritter

CHATTANOOGA . . . Jan. 9, plant tour, United Hosiery Mill, Chattanooga, with hosts Mrs. Mae Wolfe, vice president for quality control and a charter member of the Chattanooga section, along with section members Keith Wilson and Bailey Williams . . . F. E. Tugman, president, United Hosiery Mill, welcomed the group . . . Everyone acquired some of the firm's well known "Buster Brown" products—children's socks, shirts, pants, sweaters, etc. . . .

John L. Rose, Jr.

CHICAGO . . . Apr. 5, circle the date on your calendar and plan to attend the Sixth general meeting of the season—6:30 p.m., Bar Association, 29 S. LaSalle St., Chicago, Ill. . . . For dinner reservations contact Miss Ann Livingston, Zenith Radio, BE 7-7500, Ext. 425 . . . Dr. J. Stuart Hunter will discuss "Evolutionary Operations" . . . Technical chairman of this program will be Karl Bauer, Abbott Laboratories . . .

Dr. Hunter had been listed as the speaker for the Mar. 8 meeting as published in the March issue. In his place, J. Rere, Caywood Schiller Associates, was scheduled to speak on "Operations Research."

Enrollment was tops as the advanced course on statistical principles began Jan. 31 at the University of Illinois, Navy Pier, Chicago, Ill. Instructors are Dr. Marjorie L. Sutherland of Sutherland-Jacobson and Associates, and Miss Mae Goodwin Tarver of Continental Can Co.

The Central Illinois, Chicago, Kankakee-Joliet and Rockford sections sponsored the second annual "All Illinois Conference" on Saturday, Feb. 4, at the University of Illinois, Urbana, Ill.

Toastmaster was Professor K. J. Trigger, Head of Industrial Engineering, University of Illinois.

Chairmen were C. J. Streib, Sundstrand Corp.; D. W. Gierke, National Cylinder Gas Co., and G. J. Burt, Joliet Arsenal.

Speakers were Robert Boeke, John Deere & Co., Moline, Ill.; W. B. Biship, Sr., A. E. Staley Co., Decatur, Ill.; Dr. I. L. Heckman, professor of management, University of Illinois; A. H. Benscoter, J. E. Griffin and R. H. Johnson, A. O. Smith Co., Permaglass Division, Kankakee, Ill.; Dr. W. C. Jacobs, professor of biometry and data processing, University of Illinois; J. F. Jeffrey, Caterpillar Tractor Co., Joliet, Ill., and Dr. I. W. Burr, professor of mathematics and statistics, Purdue University.

John Dittrich

CLEVELAND . . . Jan. 6, there was no depression this night when Cleveland section members participated in "Making Management Decisions for a Manufacturing Enterprise" . . .

The group participation was led by Dr. Frank Childs, associate professor of industry and statistics, Western Reserve University. Each "plant" had to make its own decisions and compare its profits with the other "plant" present. It was most interesting and enjoyable.

Apr. 7, George P. Box, Army Statistical Research Center, Madison, Wis., will speak on "Automatic Optimization" . . .

Howard O. Schmidt

COLUMBUS . . . Jan. 4, joint dinner meeting with the Columbus Chapter of the American Society for Metals . . . D. H. W. Allan, metallurgical statistical analyst,

American Iron and Steel Institute, New York, N. Y., gave a very interesting talk on "Metallurgical Quality Control" . . .

Jan. 18, joint meeting with the IRE Professional Group on Reliability and Quality Control . . . Robert Yereance Sr., electrical engineer, Battelle Memorial Institute, spoke on "Reliability Field Failure Reporting" . . .

May 17, Westinghouse Corp., "Reliability Evaluation of a Weapon System" by R. C. Draudt, chief QC analyst, Columbus Division, North American Aviation Inc. . . .

G. E. Arris

CORNING-ELMIRA . . . Jan. 10, Hardinge Brothers, Inc., Elmira, N. Y. . . .

Following a buffet supper, plant tours were conducted by Hardinge personnel. This plant, which manufactures machine tools and collets, employs some very interesting automated machines.

Apr. 11, Hickory House, Horseheads, N.Y., R. M. Hofstead, assistant director of statistics, Bristol Laboratories, Syracuse, N. Y., will discuss "What Kind of people?" . . .

Richard J. Gibson

DALLAS-FORT WORTH . . . Jan. 19, inspection clinic with Harold C. Waite, district manager, Brown & Sharpe Manufacturing Co. . . . The topic—"Back to the Basics in Precision Measurement" emphasized the part played in industry by the inspector . . .

Following the dinner, Joseph L. Bernick, quality manager, Nuclear Division, The Martin Co., Baltimore, Md., gave an extremely interesting slide-illustrated talk on "Nuclear Energy Goes to Work." This talk gave those of us who had little knowledge of the construction and uses of an atomic reactor a much better understanding of what makes a reactor "tick" and its potential peacetime applications.

R. R. Massegee

GREATER DETROIT . . . Jan. 19, 100 persons met at the Dodge plant, Chrysler Corp., to hear C. G. Bauer, Chrysler's staff director of quality control, tell us about the requirements for a quality control program, as dictated by customers . . .

Mr. Bauer has had many years of experience both in manufacturing and quality control.

C. L. Tomlinson, quality engineering supervisor, Chrysler Imperial, a section board member, told how both mechanics and QC operators attended QC training sessions on their own time.

He spoke especially of the necessity for inspecting welds, and of the excellent results that have been produced by the program.

Frances D. Huntington

EVANSVILLE-OWENSBORO . . . Jan. 17, Vendome Hotel, Evansville, Ind., C. R. Wade, QC manager, RCA Whirlpool Corp., Evansville, summarized some of the methods used by his firm in conducting process capability studies . . . The guest list for the evening read like a Who's Who . . . Harry Musgrave, who hosted the affair, had a large case of laryngitis but salvaged enough voice to carry out the program in excellent fashion . . .

Apr. 18, Owensboro, Ky., members who enjoyed the November plant tour of Bucyrus Erie, Inc., as guest of Ed Stiles will be happy to know that Ed is our April speaker.

The rest of you will enjoy meeting Ed and we are certain he will give you a new slant on certain QC activities. See you in Owensboro?

W. E. VerWayne

HAMILTON-MIDDLETOWN . . . Apr. 5, 7 p.m., "Ladies' Night" at the Colony Restaurant, directly across from the Sheraton Gibson on Walnut Street . . . Dinner will be preceded by a cocktail half-hour with our hosts—Robert Westheimer and Fred Weller . . .

After dinner we will proceed to the brokerage office of Westheimer and Co. Mr. Westheimer and Mr. Weller will explain the functions of the brokerage house, its operations, the "Board" in the customer's room, and Westheimer's research operation.

Our hosts will also discuss the use of statistics and statistical sampling in financial analyses of corporations and in predictions of trends in the economy and in a particular company.

Lon Ely

HAMILTON . . . Jan. 12—ASQC, the Canadian Industrial Management Association, and the Engineering Institute of Canada held a joint dinner meeting in the Ebony Room of Robert's Restaurant . . .

A capacity crowd heard "Management's Responsibilities to Produce a Reliable Product" very capably presented by William A. MacCrehan, Bendix Corp., Baltimore, Md.

Apr. 13, case history panel discussion with a panel of Toronto section ASQC members. . . . Also, election of officers . . .

O. W. Holland

HARRISBURG . . . Jan. 4, joint meeting with the American Chemical Society, Arcadia Cafe, Lancaster, Pa. . . . Fred Gropper, engineering service division, E. I. Du Pont de Nemours & Co., Inc., Wilmington, Dela., presented "Operations Research" . . . He showed slides and gave a general review of the various forms used to gather information on items such as inventory control, distribution studies, data processing, information and data retreival, project planning and scheduling risk analysis, pricing studies, and special mathematical applications . . .

He omitted mathematics and concentrated on the concept and structure of the methods he employs.

Apr. 5, Management Night, pre-meeting clinic 5:30 p.m., dinner 6:30 p.m. at Castigilia's . . . "A Quality Control Program Should be a Cost Reduction Program" by Harmon S. Bayer, QC Consultant, Detroit, Mich.

Ann Englehart

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HARTFORD . . . Jan. 25, Second Annual Hartford Section Seminar, Dorian Shainin, vice president, Rath and Strong, Inc., described 13 ways of decreasing or eliminating avoidable costs . . .

Techniques and tools discussed in the afternoon and evening sessions were the avoidable cost chart, precontrol charts, variation research method, full factorial experiments, square designs, fractional factorials, component search patterns, random balance designs, multiple balance designs, evolutionary operation, random evolutionary operation, sampling by variables, and sampling by attributes.

Fifty-two persons attended the seminar.

L. J. Sespaniak

STATE UNIVERSITY OF IOWA . . . Jan. 27, Moline, Ill., Simon Krasner, St. Louis Air Procurement District, explained that the most important attribute of a quality demerit rating system is the use of a consistent system of evaluation . . .

E. B. Godsey

KANKAKEE-JOLIET . . . Jan. 10, Mickelberry's Highway Inn, Chicago Heights, Ill., "Evolutionary Operation" by Mrs. Florence Pohley Ritz . . .

A graduate of the University of Chicago, Mrs. Ritz holds a bachelor degree in mathematics and a master degree in Business Administration. She majored in statistics for the advanced degree. She was previously employed by Armour and Co., and Abbott Laboratories, and is currently a statistician with the Simoniz Co.

She is also teaching a course in "Introduction to Statistics for Scientists" at the Chicago Central YMCA.

Evolutionary Operation, more commonly termed EVOP, is a method whereby processes can be improved while maintaining normal production. Mrs. Ritz's examples were from the chemical field but EVOP can be applied to many other operations where two or more variables affect the end product.

May 2, panel discussion and election of officers . . .

John E. Rauworth

KANSAS CITY . . . Jan. 19, for those who are interested in gaging and automation (and who in Quality Control isn't?) this meeting was an event to be remembered . . . Bob Ruppert, Sheffield Corp., led us through the development of Gaging and Automation from the Stone Age right up to the edge of tomorrow . . . Mr. Ruppert is new in our section but not in the field of automatic gaging . . . This was one of the best presentations of its type that this reporter has heard for a long time . . .

A new publication has made its appearance on the Quality Control horizon. Editor Mike Putthoff and Associate Editor John Schuler have issued Vol. 1, No. 1 of the Kansas City Newsletter—designed to keep the local membership better informed on section activities, problems, and progress. Congratulations to the editors for a fine start on a very worthwhile activity.

Chairman Cliff Cutler has given former chairman John Cobb the assignment of writing a section history.

H. Afton Taylor

LEXINGTON . . . January meeting, Scott Michaels, mathematics and statistics department, Proctor and Gamble, spoke on the "Use of Statistics in Cost Reduction Projects" . . . Harry Smith, head of the firm's mathematics and statistics department, was a special guest at the meeting . . .

J. Graff

LIMA . . . Jan. 10, the section traveled to Superior Tube Co., Wapakoneta, Ohio, to be entertained by the dramatic presentation—"Curves can be Poisson" written by Miss Bonnie B. Small, Western Electric Co., and ably directed by Darrell C. Fultz, Ford Motor Co. . . .

Apr. 11, 7:30 p.m., meeting at the Standard Oil Company of Ohio, Lima, Ohio . . .

Ray Decker, Standard Oil, will present "Sohio Inspectors Apply Statistical Methods."

May 9, members and new and old officers will hold their annual Mardi-Gras dinner meeting at the "New Milano Club," Lima Ohio . . . Installation of officers, special entertainment, liquid refreshments, and various activities will be the schedule for the evening . . .

E. K. Anderson

LOS ANGELES . . . Jan. 24, the Hughes Aircraft Panel headed by P. J. (Pat) Mallon broke the 1960-61 general meeting attendance record with a total of 527 members and guests . . .

Dr. N. I. Hall, vice president of engineering, Hughes Aircraft Co., gave a brief talk on "Looking Towards the Future of Quality Control and Reliability."

Mr. Mallon gave a good review of how the Corporate Director's Office communicates and directs policy to the various operating plants.

J. J. Tamsen, quality manager, Communications Division, presented "Videosonic Instructions Raise Quality Standards." Mr. Tamsen pointed out that where the normal training period, for new employees, requires ten days to hit the standard production rate, this can be reduced by a single day where videosonic instruction has been properly planned.

Apr. 25—Aerojet-General Corp., producers of Liquid and Solid propellant rockets, will present a panel headed by W. E. Campbell, director, quality and reliability . . .

W. E. Zisch, vice president and general manager, will be the "spotlight speaker."

Department heads of the quality control organization at the Azusa plant will cover "The Contractor's Role in Quality and Reliability."

Steve Kozich

LOS ANGELES—VALLEY SUBSECTION . . . A Valley subsection to the Los Angeles section to serve the San Fernando Valley was recently established during a meeting attended by 25 members of ASQC.

E. J. Lancaster, chairman of the Los Angeles section, announced the following appointments to serve as officers of the subsection through June 30, 1961: chairman—H. C. Christen, Lockheed Aircraft Corp.; vice chairman—D. Andree, RCA; secretary—D. Harrison, Librascope, and treasurer—O. Kohler, Marquardt.

It seems only fitting that the honor of chairman should be bestowed upon Mr. Christen, said Mr. Lancaster. He is one of the original employees of Lockheed. His 31 years of aircraft industry experience have included all phases of planning, manufacturing and inspection.

His efforts as director of quality control at the Georgia Division and presently at the California Division have played an integral part in establishing Lockheed's record of quality and reliability in its products.

MEMPHIS . . . Jan. 17, the president of ASQC, J. Y. McClure, QC manager, Convair Division, General Dynamics Corp., gave an excellent presentation on "Planned Quality Control—A Production Necessity" . . .

As an interesting sidelight to the presentation, Mr. McClure included a summary of the ASQC organization and its plans for the future.

Apr. 18, 7 p.m., the Second Annual Ladies' Night will be held as a dinner meeting at the Holiday Inn on Union Avenue . . . Robert N. Johnson, chief chemist, Process Foods Division, Kroger Co., Cincinnati, Ohio, will speak on "Quality Control in the Food Industry" . . .

W. L. Dickerson

METROPOLITAN . . . Jan. 17, Warren Purcell, Raytheon Corp., did an unusually good job for the 95 members and guests who attended the dinner meeting at the Hotel Shelburne in New York City . . .

A post-meeting survey strongly indicates that this excellent and well qualified speaker should be prevailed

A JetStar provides the background for this photo during a plant tour of Lockheed Aircraft Corp., Marietta, Ga., by the Georgia section, ASQC. From the left—David A. Webster, QC director, Lockheed; J. Y. McClure, president, ASQC, with Convair, Fort Worth, Texas, and Mrs. McClure; Mrs. Field and E. G. Field, secretary of the Georgia section, ASQC, and George Molzahn, QC department, Lockheed.

upon to reduce his timely and effective viewpoints to writing for publication in *Industrial Quality Control.*

The untimely and significantly unusual snowstorm which was promised for Feb. 1 but did not arrive until Feb. 4 necessitated a cancellation of the Seton Hall University All Day Chemical Conference. Both section chairman Bill Frey and conference chairman Lou Pasteelnick are working in an eleventh hour attempt to reschedule this well prepared event. The probability of inclusion in the 1960-61 program of meetings is about 0.5 or fifty-fifty.

S. G. Orban

MILWAUKEE . . . Jan. 16, at a dinner meeting at the Milwaukee Inn, H. Mack Truax, QC manager, Atlas Powder Co., Wilmington, Dela., spoke on "Cumulative Sums," including the basic theory and a brief explanation of the method and areas of application . . .

This technique, which is a further refinement of the basic control chart, is particularly valuable for quickly disclosing trends or shifts in processes. The basic theory, developed in England, has been successfully used by Mr. Truax and is gradually gaining wide acceptance in this country. His provocative talk was followed by a very interesting question and answer session.

Our dinner meeting was preceded by a presentation on the advantages of and uses for Electronic Gaging Equipment. Lester Nelson, representing the Cleveland Instrument Co., covered the field very well and in a general way which applied to most of the electronic gaging equipment on the market today.

Darrel Schroeder

MINNESOTA . . . Jan. 10, the joint meeting with the American Statistical Association brought out a large group to hear Professor Milton Sobel, department of statistics, University of Minnesota, give a comprehensive and technical discussion "Acceptance Sampling with New Life Test Objectives" . . .

Feb. 1, annual open dinner meeting with wives and/or husbands as guests . . .

After a very happy cocktail hour we heard Ronald Brown, speech department, University of Minnesota, present "Comments on Communication."

Mr. Brown's highly amusing talk lead us to wonder why more errors don't arise out of a misunderstanding of the meaning the other fellow is trying to convey. The evening was highly successful and the visitors seemed happy and impressed with our new meeting place.

Bill Beck, our present chairman, and Jule Enstad, past chairman, were members of a panel this month that discussed "Are Quality Control Engineers Industrial Engineers?" at a meeting of the American Institute of Industrial Engineers. Don Bansell, a member of both groups, served as moderator.

Violet M. Rice

MONTREAL . . . Jan. 11, unfortunately R. L. Myers, Westinghouse Corp., Elmira, N. Y., was unable to speak for the scheduled monthly meeting . . .

Instead, the meeting took the form of a QC problem clinic . . . This was an expansion of our regular pre-meeting clinic style which had prompted active participation. The group discussed some problems concerned with QC in the pulp and paper industry.

Apr. 12, Ed Beckett, Northern Electric, will present "Getting Results from Your Training Program" . . .

May 10, Peter F. Wade, Price Waterhouse and Co. Ltd., will discuss "Case Histories" at the Ecole Polytechnique in May . . . Mr. Wade is section membership chairman and an instructor in the section's advanced QC course . . .

T. F. Waterston

MUNCIE . . . Apr. 11, 6:30 p.m., joint meeting with the Indianapolis section, Carpenter's Restaurant, State Road 67, followed by a plant tour at Kimble Glass Company conducted by Ed Spence, plant manager . . .

C. B. Johnson

GREATER MUSKEGON . . . Jan. 12, 77 members of the Greater Muskegon and Grand Rapids sections toured plant 6, Instrument Division, Lear Inc. . . . The group observed the manufacturing of parts and the assembly of aircraft and missile instruments under ideal and optimum conditions . . .

The entire facility is air conditioned and pressurized to discourage the entry of dust; a microscopic particle could ruin a precision instrument.

Lear machinists work to tolerances 10 times tighter than those of industry in general, some being as close as that space between the eye and the eyelid.

Apr. 20, President's Night, J. Y. McClure, ASQC president, will be the guest speaker . . .

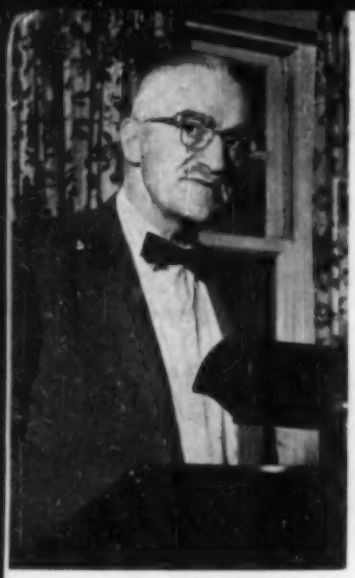
In May we will have our joint meeting with the other groups associated with the Muskegon Manufacturers Association. The place will be Stern's Steak House, but the date is still indefinite.

William A. Hume

NORTHEAST TENNESSEE . . . Jan. 12, Management Night, Kingsport, Tenn. . . .

This meeting is considered to be the most successful meeting to date. At the pre-session clinic in the Tennessee Eastman Auditorium, 70 persons heard G. W. Hakanson, Tennessee Eastman, speak on "The Quality Control Organization."

Dorian Shainin, vice president, Rath and Strong, Inc., spoke on "How to Unearth and Implement Cost Reduction Ideas." In his talk, Mr. Shainin explained how costly problems could be detected and corrected



In January, during a joint meeting of the Philadelphia ASQC and ASTM sections, Dr. J. M. Juran described "Everyday Applications of Quality Control Techniques." Dr. Juran was the speaker at the first joint meeting of the two Societies several years ago.

through the use of the scientific method, the analysis method, and the use of Latin Square techniques.

Sixty-four members and 84 guests attended the meeting. Guests included members of management from industry in seven neighboring states.

Mike Gomez

OKLAHOMA CITY . . . Jan. 17, Val Gene's Cafeteria, 35 guests and members heard Harry Herner, Monsanto Chemical Co., speak on "Quality Control in a Multi-Plant Operation" . . .

Apr. 18, the section will travel to Tulsa, Okla., to hear Dr. A. V. Feigenbaum speak on "Total Quality Control" . . . The Oklahoma section will be guest of the Tulsa section . . .

J. N. Hooper

OMAHA-LINCOLN . . . Jan. 13, Past President's Night with five past presidents present—a letter from the sixth one was read . . . Each present gave a short talk indicating the growth of QC in their plants and the unique items and applications that they are making . . .

T. C. Anker

ORANGE EMPIRE . . . January meeting, "Selling Quality" was the topic of a talk by William Bredenbeck, QC manager, Robertshaw-Fulton, at the Anaheim Bowl . . .

The Department of Defense Specification for Quality Control MIL-Q-9858 was the topic of a "round table" discussion, with Gardner L. Mason, QC manager, Aeronutronic, guest panelist. Howard Ingram, chief inspector, Northronics, did his usual good job as moderator of this clinic session.

MIL-Q-9858 is generating considerable interest at local manufacturing companies as the controlling specification for QC systems on DoD contracts.

Henry W. McKee

PARKERSBURG . . . Jan. 18, "Quality Control for Under Seas Cable Manufacture" an excellent talk by Jack Meredith, C & P Telephone Co., Parkersburg, W. Va. . . .

Apr. 12, Statistical Significance for Outlying Observations" by Dr. F. E. Grubbs, Aberdeen Proving Grounds . . .

Robert R. Stewart

PENSACOLA-MOBILE . . . Jan. 24, J. Y. McClure, ASQC president and manager of quality control, Convair, presented "Quality Control—A Production Necessity" . . .

Mr. McClure pointed out that a great many QC programs across the country are not planned. With Foreign competition sharpening in comparison with U. S. industry, the purpose of a QC program is to produce a quality product on schedule and at a profit. Emphasizing the requirement for effective communications, he explained that the quality function must be allowed to look at the whole as well as the unit; otherwise, it will be putting out fires with a bucket brigade in the shadow of a sprinkler system.

Apr. 13, St. Regis Paper Co., Pensacola, Fla. . . . Plant tour followed by dinner and an address by L. J. Trahan on "Beta Ray Control."

Walter D. Nencka

PHILADELPHIA . . . Jan. 26, despite the snowy weather, Dr. J. M. Juran drew close to 100 members and guests of ASQC and ASTM . . . The joint meeting had been originally scheduled for the 19th.

It is interesting to note that Dr. Juran spoke at the very first joint meeting of the two societies many years ago. He left the group many ideas concerning the management viewpoint in considering the application of the proper technique at the appropriate time. A couple of profound quotes from Dr. Juran's talk are, "Direct scientific efforts by their premises and not by their logic" and "The venturesome few only are sold results of logic—most everyone else must be sold by results."

Apr. 26, Al Sternberg informs us that a Reliability Task Group meeting will be held at the Philadelphia Textile Institute with dinner at 6:30 p.m. . . .

The subject for the evening will be "Reliability—What it Means."

A panel type program is planned with Frank Gryna, Martin Co., Baltimore, Md., acting as moderator. Panel speakers will be Gordon H. Beckhart, RCA; Harry Kimmer, General Electric Co.; Nick Fariello, Philco Corp.; Henry Schumer, IRC, and Col. T. T. Brundage, U. S. Air Force.

Guests are welcome.

Albert G. Dettore

PITTSBURGH . . . Jan. 19, attendance was considerably hampered by Old Man Winter—one of the worst winters on record in Pittsburgh. For those who braved the elements, Dr. W. H. Clatworthy, Bettis Atomic Power Laboratory, had an interesting and educational session. He discussed balanced incomplete block designs and partially balanced incomplete block designs. He discussed and showed how to determine ways of assigning treatments to the experimental units in such a manner as to achieve the best possible estimates of the treatment effects.

The executive committee met in January to plan events for the remainder of the year. In addition, Bill Martin, section chairman, reported on the success of the ASQC Management Seminar recently held in Pittsburgh. The total attendance was 38, with nine men from the Pittsburgh area.

Looking ahead, to both spring and our April program, we are expecting a good turnout for the discussion on "Multivariate Quality Control" to be given by J. Edward Jackson from the Eastman Kodak Co.

Any members visiting in our area are always most welcome to join our section and its activities. Several of our members have reported on attending meetings while visiting in other cities.

Chester R. Smith

PITTSFIELD . . . Jan. 11, the executive committee held a meeting during which the By-Laws Committee gave a report of its findings . . .

It was decided to try a mailing service for the remainder of the year, and a motion was made and carried to donate "Grant & Moroney" in hard covers to the Berkshire Atheneum.

Jan. 18, 59 attended our regular monthly meeting at the Stanley Club . . . Our program for the evening was a triple barreled affair—two of our members spoke, and they were followed by movies . . .

Frederick C. Hartwell, Peter J. Schweitzer Co., Lee Division, presented a very enlightening talk on the Paper Industry, dealing with paper for the capacitor

Expanded facilities for Quality Control are provided in a new QC Laboratory designed to keep pace with the increasing range of products marketed by Johnson & Johnson Ltd., Montreal, Canada. Participants in opening ceremonies, from the left, are Dr. L. A. Cox, director of research; W. G. Brayley, president; J. Dowd, who came out of retirement to cut the ribbon; J. MacDonald, chairman of the board of directors, J. Richer, director of quality control and program committee chairman of the Montreal section, ASQC, and J. Barr, vice president of operations. Mr. Dowd, for 30 years quality control supervisor, was an active member of ASQC.

industry in particular. He included slides, which at least for this writer, were a big help to a better understanding of the manufacturing process.

Richard Powell, Sprague Electric Co., North Adams, Mass., also gave us an excellent talk on product reliability. His talk was more of a technical nature and was concerned with AQL's in the order of 0.1 to 0.001 and how they are achieved.

Following Mr. Powell's talk, we were shown two movies—*Sheffield Automatic Inspection and Assembly* and *Sheffield Multiform Grinding.*

Howard Greenslet

PORTLAND . . . At the last meeting, members enjoyed a talk by Lt. Blackwood, commanding officer of the record division, Bureau of Police, Portland, Ore. . . .

Lt. Blackwood has had 23 years of service with the Bureau of Police and is experienced and qualified in the application of statistical methods to police work. He discussed events leading up to the present, including the use of IBM equipment, and how modern applications reduce costs and increase efficiency.

Apr. 13, final plans have been made for the One Day Workshop at the Sheraton Hotel in Lloyd Center . . . Dr. J. M. Juran will conduct the workshop which will be directed toward management . . .

Workshop committee members are Casey Hoekstra, general chairman; Ray Vanderzan, publicity chairman, and Jim Abell, arrangements.

Registrations will be handled by the Portland Chamber of Commerce under the direction of Pat Keyes.

Don Hancock will be host for the after dinner speaker—Howard Vollum, president of Tektronix, Inc., and Henry Blood will be host for Dr. Juran.

Don Hancock, Henry Blood and George Mickel were appointed to the nominating committee.

George Mickel

RHODE ISLAND . . . H. Russell Beaty, president of Wentworth Institute, was challenged by several section members to defend a statement that he made at the 1959 New England Quality Control Conference, Providence, R. I., that the introduction of wage incentives in any industrial plant will affect the quality of the product.

He rose to the challenge in a talk to the section Jan. 19, titled "How Wage Incentive Affects the Quality of a Product."

Dr. Beatty used his experiences and observations both from U. S. and Russian industry to back up his original statement. The Russians receive incentives in the form of personal recognition and better housing while monetary incentive is very low. According to Mr. Beatty, the quality of the products that the Russians produce, in general, was very good.

Apr. 20, Providence, R. I. . . . Title "If" by Paul K. Moffat, QC manager, M & C Nuclear . . .

Paul K. Moffat

ROCHESTER . . . The seventh annual QC Conference was held by the section at the University of Rochester.

The Rochester Institute of Technology sponsored a one day course in Cumulative Sum Charts at the suggestion of the section and through the cooperation of Richard Freund and Don Wright. Course instructor was H. Mack Truax, Atlas QC manager.

Once again RIT will offer the summer courses in Quality Control for the Chemical Industries. Several section members serve as instructors for the three week program.

The section is making available to interested schools and ASQC members several extra copies of conference transactions from past years.

Jan. 17, Robert N. Johnson, chief chemist, Process Foods Division, Kroger Co., presented "QC in the Foods Industry" to a joint meeting of the section and the reliability sub-group . . .

Al Rickmers

Article Correction

An error in the article, "Linear Contrasts, Part II," by Chester H. McCall, Jr., in the August, 1960, issue of *Industrial Quality Control* was recently brought to our attention.

In Table VIII, page 16, the upper line should extend from A through E, and should not extend under F.

Table VIII—Significant Store Differences

Mean	9.99	9.56	9.52	9.15	7.86	6.15	5.05	3.68
Store	A	H	C	B	E	F	D	G

ROCKFORD . . . Apr. 20, 7 p.m., Holiday Inn, "American Society for Quality Control and You" by A. W. Wortham, vice president, ASQC, Texas Instruments, Inc., Dallas, Texas . . .

An election of section officers will precede Mr. Wortham's talk.

Mr. Wortham will describe the services that ASQC offers to each member so that we might better appreciate the work of the Society.

Arvid R. Bloom

SACRAMENTO . . . The January meeting was a tremendous success. A large attendance of our members and nearly an equal number of guests enjoyed a fast moving discussion of "New Directions in Supplier Product Evaluation" presented by I. Paul Sternberg, QC director, Whittaker Gyro Division, Telecomputing Corp., Van Nuys, Calif.

M. K. Walker

ST. CHARLES . . . The educational program under the direction of Robert Mink got a real boost when 43 persons signed up for the course entitled "Analysis for Decision Making," an intermediate course in statistics. The ten-week course was opened on Jan. 7. It met Saturday mornings from 8 a.m. to 12 noon.

Jan. 17, Ladies' Night, Frank McLaughlin, General Electric Co., presented "The Professional Stature and Growth of Quality Control" . . .

Ellis Elder

ST. LOUIS . . . Apr. 22, Annual All Day St. Louis QC Conference, Officers' Open Mess, Lambert AFB, theme —Reliability . . . Conference chairman—J. E. Rutledge, McDonnell Aircraft . . .

The section has donated $100 each to St. Louis University and Washington University. This donation was made through the St. Louis Chapter of the Missouri Society of Professional Engineers and is to be used for engineering scholarships.

Jan. 11-12, three section members spoke at the "Quality Control for Improved Production" Seminar sponsored by ASQC and ASTME . . . Speakers were Arnold Braun, Carter Carburetor, H. Earle Moore of McDonnel Aircraft, and Rudy Freeman of Corby Supply Co. . . .

W. W. Paris

Quality control experts from throughout the nation were on hand for the special one week course in Training in Linear Metrology, just completed by MetroLonics, Inc., Burbank, Calif. John A. Harrington (right) MetroLonics, vice president-director of training, demonstrates some of the equipment shown to (from the left) Jack S. Poth, U. S. Atomic Energy Commission, Albuquerque, N.M.; Lauren McGregor, General Electric Co., Richland, Wash.; Earl Smith, U. S. Air Force, Los Angeles, Calif.; Frank Rudzinsky, Avco, Wilmington, Mass., and Thomas Sochor, Hercules Powder Co., Cumberland, Md. The course outlined the history of precision measurements, the current Department of Defense requirements for standardization, and the use of specialized equipment for comparative and absolute measurement.

ST. PETERSBURG-TAMPA . . . Jan. 9, Dr. F. E. Grubbs, chief, Weapons Systems Laboratory, Aberdeen Proving Grounds, Md., presented "Statistical Significance of Outlying Observations, QC, and Operations Research" . . .

A training course on reliability was conducted at Electronic Communications, Inc., during January for ECI manufacturing managers, supervisors and instructors. Instructors were Walter Landry, QC manager, with "Reason for Reliability"; Henry P. Stadnik with "Theory of Reliability," and Harold L. Goldberg with "Data Processing."

Jan. 23, an executive committee meeting was held at the home of Calvin Wyatt, section treasurer, in Clearwater, Fla. Several items were resolved including plans for the training course which will begin in April.

Harold L. Goldberg

SAN ANTONIO . . . Jan. 17, Dewinnies Belgium Inn, delicious steak dinner and cocktails, "Nuclear Energy Goes to Work" by J. L. Bernik, quality manager, Nuclear Division, Martin Co., Baltimore, Md. . . . A very timely and interesting paper and color slide presentation on "splitting the U-235 atom" . . . A fine turnout of 28 members and guests . . .

Apr. 18, the section is looking forward to its first annual Spring Dance . . .

Speaker for the May meeting will be Roger W. Anderson, Texas Instruments, Inc.

R. W. Worrick

SAN BERNARDINO . . . Jan. 28, Fifth Annual Inland Empire QC Conference, Mission Inn, Riverside, Calif. 250 persons . . . Keynote address by Norman J. Jacobsen, Jet Propulsion Laboratory, on "Reliability in the National Space Program" . . .

Twenty-three other widely known speakers presented four simultaneous sessions covering reliability, advanced statistical methods, process control and inspection workshop.

Apr. 19, Mural House Restaurant, Ontario, Calif., "Quality or Else" by John J. Crowley, vice president project management, Grand Central Rocket Co. . . .

Gene A. Williams

Metals Technical Committee Schedules Meeting June 6

The 27th regular meeting of the Metals Technical Committee was held in Pittsburgh, Pa., Feb. 9-10, 1961.

Reporters from six of the metals trade publications conferred with representatives of the committee. The purpose, objective, scope, and functioning of the Committee was discussed. The subcommittee meetings were also open to reporters.

The various product subcommittees continued their activities. As one activity, all subcommittees are contributing to a compilation of basic techniques case histories from the primary metal producing industry.

The 28th meeting of the Committee will be held June 6, 1961, 2-4 p.m., at the Sheraton Hotel, Philadelphia, Pa. All those interested in the mining and basic manufacture, shaping and treating of metals, and fabrication of products of an integrated metals-producing operation are welcome.

SAN DIEGO . . . Jan. 9, Sands Fireside Restaurant—a large group heard "Space Age Electronic Tracking Systems" by Robert V. Werner, executive vice president, Cubic Corp. . . .

Your reporter was particularly impressed with the apparent tremendous pressure that is constantly being exerted on "The State of the Art" to reduce weight, increase accuracy and expand the range of electronic tracking systems. I'm sure the entire membership of the San Diego section joins me in saying "Thank you very much, Mr. Werner, for giving us a fascinating peek into one phase of Space Age Electronics."

Apr. 10, Sands Hotel, "Importance of Human Engineering in the Everyday Assignment of Quality Control Personnel" by Dr. E. Aiken, California Western University . . . Studies in Human Engineering are rapidly creating utmost interest in all fields of scientific endeavor and therefore this meeting is being viewed with a great deal of interest by San Diego members . . .

L. I. Fredrickson

SOUTH TEXAS . . . A. F. Masters, Celanese R & D Laboratory, reports that nine engineers and one chemist have just completed the graduate course in basic engineering statistics sponsored by Del Mar College in Corpus Christi, Texas. The next course is called "Production Engineering Statistics" to be followed by "Mathematically Designed Experiments in R & D."

Also from Celanese—Morris Webb has just completed teaching a course in experimental design to technical employees of this company's chemical plant. The course, called "Designs for Data-Taking," was presented to 20 members of the Instrumentation Laboratory, Process Engineering, Production and Production Control Departments who had previously completed Mr. Webb's basic statistics course. A special short version of this course is offered to the department heads concerned.

Ed Franklin

SOUTHERN ILLINOIS . . . Apr. 20, panel discussion on Inspection Problems . . . Panelists from local company quality assurance departments . . . All members are invited to come prepared with problems—to stump or obtain from the panel . . .

C. O. Touchon

SYRACUSE . . . Apr. 18, Turners Restaurant, "Statistical Methods of Evaluation and Decision-Making in Management" by Paul Hill, Fairchild Semiconductor Corp., Mountain View, Calif. . . .

Jan. 24, Drumlins Country Club, joint dinner meeting with the American Society of Industrial Engineers, "Why Not Take Advantage of Your Errors" by John Biegel, assistant professor of industrial engineering, Syracuse University . . .

Mr. Biegel presented and explained several examples where $\overline{X}$ and R control charts were used to provide information relating to errors which were made inadvertently. He also described the advantages which were gained.

Two QC courses were started at Syracuse Central Technical High School on Jan. 23—"Applied Techniques of Elementary Quality Control" by Lawrence Scimone, Carrier Corp., and "Advanced QC" by Kenneth Divers, Brown-Lipe-Chapin. Both instructors are section members.

Lee E. Huyler

TENNESSEE . . . The January QC training session was conducted by H. A. Lasater, Union Carbide Nuclear Co. Norman Jeglum, Sheffield Gage Co., spoke on "Gages for Dimensional Control."

Final plans were made for the Annual QC Clinic sponsored jointly with the Northeast Tennessee section.

J. P. Reavis

TOLEDO . . . Jan. 5, "The IBM 650 Computer and Its Application in Quality Control" proved to be a very interesting topic as presented by King E. Forry, Owens-Illinois Co. . . .

Apr. 6, EST Club Rooms, "Reliability" by Dr. E. B. Ferrell, Bell Telephone Laboratories, Murray Hill, N. J. . . . Moderator—David A. Hettel, Johnson-Ruth Machinery Co. . . .

Apr. 15, Northwest Ohio All Day Conference at the Hillcrest Hotel, Toledo, Ohio. Nelson G. Meagley, Continental Aviation and Engineering Corp., is general chairman. Reservations for anyone interested in attending the conference and noon luncheon may be made with the committee or any officer of the Toledo section . . .

Carwin L. Elwick

TORONTO . . . Apr. 22, Canadian Westinghouse, Hamilton, Ontario, joint meeting with Hamilton section, "A Case Study in Process Control" by H. C. Hilditch, Lamp Division, Canadian General Electric Co. Ltd.

G. E. Culver

TRENTON . . . Jan. 26, "Challenge of Visual Inspection" by Edward Schilling, quality control engineer, RCA, Somerville, N. Y. . . .

Julius S. Mazakis

WASHINGTON, D. C. . . . Jan. 18, Professor Acheson Duncan, John Hopkins University, gave a revealing talk on some of the many problems in the "Sampling of Bulk Materials" . . .

He left the 40 persons in attendance with a challenge to investigate some of the unanswered questions in this type of sampling.

Results of the efforts undertaken by Professor Duncan and Dr. Edward Deming, *et al*, in the sampling of fertilizers have been released in a special report. For further information, contact Professor Duncan at the University.

Professor Duncan would appreciate information from *IQC* readers on titles of texts and articles dealing with the sampling of bulk materials.

Tom Williams, chairman of the membership committee, has released the news that the section still leads in

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the Society with a 98.3 percent membership renewal. Congratulations for outstanding efforts!

A few sets of the notes used in our last training session at Georgetown University are still available at $2 a set. Contact Howard Roberts, Booz Allen Applied Research, OL 6-1400.

Eugene Tucker

WESTERN MASSACHUSETTS . . . Apr. 11, Sheraton Motor Inn, Springfield, Mass., "Manufacturing Performance Analysis" by F. J. Sindelar, QC manager, IBM Corp., Poughkeepsie, N. Y. . . .

It is tentatively planned to have the manager of the Springfield IBM office act as host for the evening and to introduce the speaker. The meeting will begin at 8 p.m., in the Garden Lounge of the Inn. Dinner at 6:30 p.m.

Jan. 10, "Quality Cost Control" by Warren R. Purcell, QC Director, Raytheon Co., and a vice president of ASQC . . .

Mr. Purcell covered methods of measuring and controlling quality costs. He also included comments on plans, procedures, pitfalls, and benefits from these methods. Joe Coffman, president, Tecnifax Corp., Holyoke, Mass., introduced Mr. Purcell. In the course of his introduction, Mr. Coffman made several interesting comments and observations concerning quality control.

May 9, "Quality Control—Its Own Best Salesman" by W. D. Parker . . .

Alan J. Donnelly

UNIVERSITY OF WESTERN ONTARIO . . . During January J. E. Crossman, past chairman, presented lectures on Quality Control to students of the Canadian Industrial Management Association. The lectures were held in Stratford, Ont.

Apr. 19, Stratford, Ontario, "Quality in Our Canadian Economy" by W. E. Currie . . .

Report of the Nominating Committee

In accordance with provisions of the Constitution, the Nominating Committee submits the following slate of nominees for the several elective offices of the Society for the Fiscal Year 1961-62.

For President:
A. V. Feigenbaum
General Electric Company
New York, New York

For Vice President (4):
L. S. Eichelberger
A. O. Smith Corporation
Milwaukee, Wisconsin

G. W. McElrath
University of Minnesota
Minneapolis, Minn.

W. R. Purcell
Raytheon Manufacturing Company
Newton, Massachusetts

L. A. Seder
Quality Control Consultant
Malden, Massachusetts

For Executive Secretary:
A. W. Wortham
Texas Instruments, Incorporated
Dallas, Texas

For Treasurer:
R. L. Fiaschetti
Ansco General Aniline & Film Corporation
Binghamton, New York

Each of the above named candidates has expressed his willingness to serve if elected.

The Nominating Committee believes that the slate of officers selected constitutes a strong officer team and commends it to the membership.

Pictured at the Interdepartmental Three Day Symposium on Army Quality Control of Foods were Roy T. Lennertson, deputy administrator, Agricultural Marketing Service, Department of Agriculture; Brig. Gen. Russell McNellis, chief Veterinary Division, Surgeon General; Maj. Gen. Charles C. Calloway, director of Operations, OQMG, and Willis S. McLeod, director of Standardizations, General Services Administration.

The Quartermaster General Hosts Interdepartmental Symposium

A three-day symposium on subsistence quality control, designed to promote closer understanding of the Military Subsistence Quality Control program among government food agencies, was concluded Dec. 9 at Office of The Quartermaster General, Washington, D.C.

Hosted by The Quartermaster General, the sessions drew representatives from interested elements of the Department of Defense, the Department of Agriculture, General Services Administration and the Fish and Wildlife Service of the Department of Interior.

The Quartermaster General procures, through the Military Subsistence Supply Agency, approximately $700,000,000 of subsistence annually. He has the responsibility of supplying food to the Army, Navy, Air Force and Marine Corps. Federal and Military Specifications are used for the procurement of subsistence. The Department of Agriculture is the preparing activity for most Federal Subsistence Specifications; military food items specifications are prepared by the Food & Container Institute for the Armed Forces, an element of the Quartermaster Corps, at Chicago, Ill.

The Army Veterinary Corps and the Department of Agriculture perform inspection and grading of animal origin products at the plants of various contractors throughout the country. Fruits and vegetables, grain and grain products, and some processed products, are graded by the Agricultural Marketing Service, Department of Agriculture, while seafood product grade standards are prepared by the Fish and Wildlife Service of the Department of Interior. These complex arrangements for quality control and inspection of food stuffs make it necessary for the agencies to exchange ideas and to agree upon a basis for controlling the quality of food stuffs procured by the government.

Jan. 16, joint meeting with the St. Thomas Foremen's Club in St. Thomas, Ontario . . .

R. L. MacGregor, factory manager, Wolverine Tube Ltd., London, discussed today's economic problems. He quoted the wholesale price of some common imported articles to stress his point. He was confident we could meet this challenge by producing at a lower unit cost. One way to achieve this was through the use of the work sampling plan and he explained how to apply it to everyday problems.

J. S. Crossman

WICHITA . . . Jan. 17, Harry O. Hehner, QC manager, Monsanto Chemical Co., St. Louis, Mo., presented "How You Can Make a Multi-Plant QC Program Work" . . .

This talk was very interesting and can be applied to many Wichita Industries that operate more than one plant under one QC manager. Mr. Hehner presented the subject in a manner that allowed questions at any time. The talk was very well received.

A film produced by Western Electric Co., "Seconds for Survival," was presented after Mr. Hehner's talk.

We antipicate intense interest in our Apr. 4 and May 2 meetings. The topics — "Calibration Requirements for Government Contractors" on Apr. 4, and "Quality Control Management" for May 2, are both very timely and important subjects. In these days of tougher competition and more sophisticated techniques, such subjects require special attention.

H. K. Mitchell

WORCESTER . . . Jan. 19, Charles W. Carter, Industrial Consultant, discussed the principle of maldistribution as the key to QC problems . . .

Mr. Carter illustrated with slides the problem areas where the greatest effort can be applied to yield the most improvement, and thus, meet the increasing challenge of lower quality costs.

Apr. 17, plant tour, Carling Brewing Co., Natick, Mass., "QC at Carling" by Donald Davidson . . .

D. J. Burda

YOUNGSTOWN . . . Jan. 5, "The Quality Control Engineering Job" by Stephen T. White, Manufacturing Services Division, General Electric Co.

He emphasized that modern QC requires a more broadly trained and skilled engineer whose competence extends beyond that of a skilled individual.

Mr. White is a senior member, ASQC, and a member of the ASQC executive board.

The meeting was attended by 43 members and guests.

Apr. 6, Dr. M. E. Terry, member, technical staff, Bell Telephone Laboratories, Murray Hill, N. J., will present "Design of Experiments" . . .

May 4, Ladies' Night, "Peculiarities of American Presidents" by William Pringle, secretary, East Ohio Gas Co. . . .

Charles T. Wirebaugh

Significant Differences

. . . ALLENTOWN-BETHLEHEM — **Dave Hilder,** assistant supervisor in charge of semiconductor production, Western Electric, and a past chairman of our section, has been enrolled in his firm's School for Advanced Management Training in New York City. Due to his prolonged stay in New York, his role as district program aid chairman, ASQC, has been assumed by **Vince Lukach,** also of Western Electric.

On Jan. 3, **Dick Zwickl** spoke to members of our Reading subsection on "Application of QC to Heavy Press Work."

. . . BOSTON — **Richard W. Bishop,** Northeastern University, has been appointed editor of the *Blue Book* published by Engineering Societies of the North East.

6th ASQC Workshop-Seminar

Management of Quality Control

April 6-7-8, 1961

Hotel Roosevelt, New York

APRIL 6

Seminar Organization
Paul C. Clifford
Securing Agreement on Quality Needs and Objectives
Joseph M. Juran
Using Quality Costs
Theodore E. Schultz, General Electric Co.
Planning the Control of Incoming Materials
Chester Gadzinski, Raytheon Corp.

APRIL 7

A Program for Total Quality Control
A. V. Feigenbaum, General Electric Co.
Quality Engineering—The Pre-Production Phase
Frank Delaney, IBM Corp.
Quality Engineering Product and Process Control
Eugene West, Radiation, Inc.

APRIL 8

Evaluation of Contractor Quality Control Systems
John J. Riordan, Department of Defense
Quality Programming for Process Industries
Maynard Renner, W. R. Grace and Co.
Quality Control—Its Growth and Future
J. Y. McClure, Convair
Building Company Confidence in Quality Control
Dale A. Cue, Hoover Ball and Bearing

Registrants will be sent study materials and case studies prior to the conference. Registration is limited to 75 persons and is complete only on receipt of the registration fee of $125 for non-members, $100 for member, which includes the cost of three lunches.

Your Registration will be acknowledged. A room reservation card for the Hotel Roosevelt will be enclosed with the acknowledgment.

ASQC Institute
Paul C. Clifford, Director

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ASQC Institute
161 West Wisconsin Avenue
Milwaukee 3, Wisconsin

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NOTE: Additional registrations may be made by attaching a list to this coupon. Please include necessary information for each registrant.

. . . BUFFALO—**Wilbur Burns**, program chairman, and **Richard Duroure**, assistant program chairman, are making arrangements for the 1961-62 program.

Lew Felleisen, Moog Valve Co., East Aurora, N.Y., has been named membership attendance chairman in place of **Walter Pukalo**, who has been tied up in a training program at General Electric Co. A sincere welcome is extended to both new members of the board.

. . . CHICAGO — The Central Illinois, Kankakee-Joliet, Rockford and Chicago sections sponsored the Second Annual All Illinois Conference Feb. 4 at the University of Illinois, Urbana, Ill.

. . . CLEVELAND — **Raymond F. Zeller** is now QC manager, Grabler Manufacturing Corp. He transferred here from the Orlando-Cape Canaveral section.

Ed Adams, formerly with Aro Equipment Corp., is now project engineer, Meriam Instrument Co.

. . . DELAWARE — **Robert D. Fleck** has been appointed QC manager for Continental-Diamond Fibre Corp., Newark, Del.

. . . DALLAS-FORT WORTH — The training course, quality control organization and supervision, which was started on Feb. 15, will be concluded Apr. 5. Course instructor — **M. R. Seldon**, quality assurance manager, Vought Astronautics Division, Chance Vought Corp.

. . . GREATER DETROIT — **J. D. Lawson**, Ford Motor Co., has organized and started three courses at Cleary College in Ypsilanti. They are industrial inspection, statistical quality control, and management administration. The four credit-hour classes are open to full time students and to others, since they are scheduled in the evening.

. . . EVANSVILLE-OWENSBORO — We were recently informed that **Ed Stiles** has been promoted to production scheduling supervisor at the Bucyrus Erie Manufacturing Co., Evansville, Ind.

. . . HAMILTON-MIDDLETOWN — Two door prizes were presented at the meeting Jan. 4 at the Sports Bowl, Middletown, to **Gordon Thompson** and **Glen Dare, Jr.**

. . . HARTFORD — **Bob Phelps** has been promoted to supervisor of QC engineering, Royal McBee.

Earl O. Smith has been promoted from QC superintendent at General Electric Co., Plainview, to manager advanced QC engineering, small aircraft engine department, General Electric Co., West Lynn, Mass.

Donal R. Whitney has been appointed QC manager for the Whitney Chain Co., Hartford, Conn., subsidiary of Foote Bros. Gear Machine Corp. For the past three years Mr. Whitney has been engaged in QC work in the manufacture of nuclear reactors at Combustion Engineering, Inc., Windsor, Conn.

. . . LEXINGTON — **Don Dunn**, past chairman of the Lexington section, has been promoted to manufacturing assembly superintendent of the Electric Typewriter Division of IBM. **C. L. Reardon** will succeed Mr. Dunn as division quality manager.

Bill Eckert, IBM, has been appointed secretary of the Lexington section — replacing **Jack May**, who has resigned.

. . . LOS ANGELES — Because of the large monthly turnouts at our meetings, many restaurants are submitting proposals to handle our meetings next year. This is something — for we used to beg for our meeting places! This section has the largest monthly average attendance of any technical society in Southern Calif.

I don't know if you would call this is a significant diffference, but your reporter lost a dinner bet to **Jack Lancaster**, section chairman. I wagered that he could not have an Atlas or some large missile or plane for the Aircraft and Missile Conference. Well, the Atlas will be on the front lawn and now we have another bet for a Trainer.

Bernard Hecht announces that his firm, Bernard Hecht and Associates, has moved to new and larger offices in the Lee Tower Building, 5455 Wilshire Blvd., Los Angeles, Calif. Mr. Hecht, president of the firm of quality control and reliability improvement engineers, says the expansion move was necessitated by the increase in missile work in the Los Angeles area. Special Reliability Training Courses and Quality Control programs have recently been established for Hughes Aircraft, Nortronics, Marquardt Corp., Sprague Electric, and others, said Mr. Hecht.

Joseph S. Meyer is now a senior associate with Bernard Hecht and Associates. Mr. Meyer was formerly associated with Telecomputing Corporation and Metrolonics, Inc. Mr. Meyer is a graduate of the U.S. Naval Academy and has had many years of engineering, quality control and reliability experience in the electromechanical devices field.

. . . METROPOLITAN — **Dean Voegtlen** has been promoted to manager of product assurance and research services for the Service Company Division of Radio Corporation of America, Riverton, N.J. He was formerly manager of Applied Research Services at Rome, N. Y. In his new capacity he will coordinate the activities of new Techniques Development and the application of these methods in various divisions of the company.

Russell F. Vizzi, Federal Electric Corp. Paramus, N.J., has been appointed QC manager on the Tital project, a multi-million dollar contract recently awarded FEC by the Martin Company for the installation and checkout of Air Force Tital ICBMs and related ground support equipment at Larson AFB, Moses Lake, Washington. Mr. Vizzi formerly was senior quality control engineer in the Depot Level Maintenance program on the Distant Early Warning (DEW) Line Project, another FEC contract. In 1958 was appointed supervisory engineer.

Dr. James B. Normington, formerly superintendent, chemical quality control, has been appointed QC manager of the Antara Chemicals Division, General Aniline & Film Corp. Responsibilities will include quality aspects of raw materials and manufactured goods.

Lester B. Lipset has been appointed manager of the QC department of the Narda Microwave Corp., Mineola, L.I., and will be in charge of the eight various stages of inspection and testing operations at Narda. Mr. Lipset was formerly Narda's chief test engineer and QC engineer. He was responsible for analyzing the design and development engineering of Narda's new products with

Professional Development Note

Wayne M. Biklen

Wayne M. Biklen has been appointed vice president and general manager of the Staunton operations of ASR Products Co., a division of Philip Morris, Inc. His new position also includes responsibility for the functional operation of the firm's plant in Glasgow, Scotland.

Mr. Biklen

Mr. Biklen entered the employ of ASR in 1953 as manager of quality control. He was responsible for setting up this department and when it became a division, he was made director. In March, 1957, he was appointed director of engineering and in February, 1959, was made manager of operations. He has held the position of general manager-Staunton operations, since June of 1960.

A native of Burlington, Ia., Mr. Biklen is a 1935 graduate of Iowa State College and did further graduate work at Purdue University.

Mr. Biklen and the former Miss Nancy Riegel of Davenport, Ia., have four children—Michael, David, Mary Ann, and Thomas. Michael is presently a student at Bridgewater College.

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SECTION CALENDAR (APRIL 1 TO MAY 10)

SECTION	DATE	PLACE	TIME	SUBJECT	SPEAKER
Akron-Canton	Apr. 28	Akron University	8:15 a.m.	Third Annual Seminar	Various
Allentown-Bethlehem	Apr. 4	Reading, Pa.	7:00 p.m.	Setting Up a QC Program and QC Applied to Incoming Inspection	Workshop by Reading Subsection
	Apr. 12	Hotel Traylor, Allentown, Pa.	6:30	Dinner Meeting	Local participation
Baltimore	Apr. 18	Clifton Park Mansion House	8:15	Experimental Design and Market Research	E. J. Delate, E. I. DuPont de Nemours & Co.,Inc Wilmington, Del.
Battle Creek-Kalamazoo	Apr. 20	Post Club House, Battle Creek, Mich.	8:00	Purchasing Viewpoint of Quality Control	Earl H. Nelson, Checker Motors Corp., Kalamazoo, Mich.
Birmingham	Apr. 14	Line Material Industry, 1700 Vanderbilt Road Birmingham, Ala.	4:00	Plant tour and dinner meeting	To be announced
Boston	Apr. 13	MIT Faculty Club	8:00	Interpreting Results from Testing Processes	Dr. Grant Wernimont, Eastman Kodak Co., Rochester, N.Y.
	May 18	MIT Faculty Club	8:00	Social night	Not Applicable
	Mar. 27	Lowell Technological Institute	8:00	Standards and Controls of Quality	Leonard A. Seder, QC Consultant, Malden, Mass.
Merrimac Valley Subsection	Apr. 6	Yankee Doodle Restaurant	8:00	Controlling Quality	Four concurrent sessions
Buffalo	Apr. 24	Niagara Manor, Buffalo, N.Y.	6:30	Statistical Thinking for Engineers	Charles R. Hicks, Purdue University, Lafayette, Ind.
Chattanooga	Apr. 10	TBA	6:30	Designed Experiments	Otto Kral, Minnesota Mining and Mfg. Co.
Chicago	Apr. 5	Bar Association, 29 South La Salle St., Chicago, Ill.	6:30	Evolutionary Operations	Dr. J. Stuart Hunter, University of Wisconsin, Madison, Wis.
Cleveland	Apr. 7	Cleveland Engineering and Scientific Center	7:45	Automatic Optimization	George P. Box, Army Statistical Research Center, Madison, Wis.
	Apr. 20	World Publishing Co.	2:00	Plant tour	To be announced
	May 5	Cleveland Engineering and Scientific Center	7:45	See How the Baby Has Grown	Ed Schrock, American Radiator and Standard Sanitary Corp., Baltimore, Md.
Columbus	Apr. 19	Columbus General Depot	6:30	Maintenance Engineering and Quality Control	Arthur C. Barr
	May 17	Westinghouse Corp.	....	Reliability Evaluation of a Weapon System	R. C. Draudt, Columbus Division, North American Aviation, Inc.
Corning-Elmira	Apr. 11	Hickory House, Horseheads, N.Y.	8:00	What Kind of People?	R. M. Hofstead, Bristol Laboratories, Syracuse, N.Y.
Dallas-Fort Worth	Apr. 20	Circle "C" Steakhouse, Grand Prairie, Texas	8:00	Demerit Rating System for Evaluating Quality Performance	Simon D. Krasner, St. Louis Air Procurement Depot, St. Louis, Mo.
Greater Detroit	Apr. 26	Stroh Brewery Co.	....	What Do You Eat and Drink?	T. C. Meravigila, Food and Drug Administration
	May 20	Ninth Annual Dinner Dance	....	Not applicable	Not applicable
Evansville-Owensboro	Apr. 18	Owensboro, Ky.	6:30	Administrative Controls in Smaller QC Activities	Ed Stiles, Bucyrus Erie, Evansville, Ind.
Hamilton-Middletown	Apr. 5	Colony Restaurant, 420 Walnut St., Cincinnati, Ohio	6:30	Statistics and Statistical Sampling for Financial Analyses of Corporations	Robert Westheimer and Fred Weller of Westheimer and Co., Cincinnati, Ohio
Hamilton	Apr. 13	Canadian Westinghouse Auditorium	8:00	Case Histories Panel Discussion and Election of Officers	Panel of Toronto section members
Harrisburg	Apr. 5	Castigilia's	5:30	Management Night — A QC Program Should be a Cost Reduction Program	Harmon S. Bayer, QC Consultant, Detroit, Mich.
	May 3	Hershey Chocolate Corp., Cocoa Inn, Hershey, Pa.	7:30	Plant tour — QC of Hershey Chocolate Products	E. W. Meyers, Hershey Chocolate Corp., Hershey, Pa.
Hartford	Apr. 11	Nutmegger House	6:30	Fastener Reliability	Paul Shuttleworth, Standard Pressed Steel Co., Jenkintown, Pa.
	Apr. 25	Underwood Corp.	6:30	Trouble Shooting Techniques	Frank Hauman, Royal McBee Corp., Hartford 2, Conn.
	May 9	Nutmegger House	6:30	Between Ether and Earth in QC	Dorian Shainin, Rath & Strong Inc., Boston, Mass.
Indianapolis	Apr. 11	Carpenter's Restaurant, State Road 67	6:30	Joint meeting with Muncie section	Ed Spence, Kimble Glass Co.
State University of Iowa	Apr. 28	Collins Radio	....	Plant tour	To be announced
	Apr. 29	To be announced	....	To be announced	Fred Leone, Case Institute of Technology
Kankakee-Joliet	Apr. 3	D'Amico's Restaurant	6:30	Process and Quality Management	Walter T. Havter, Youngstown Sheet & Tube Co., East Chicago, Ind.
	May 2	Kankakee, Ill.	6:30	Panel Discussion and Election of Officers	Various
Kansas City	Apr. 20	To be announced	7:00	Control Charting of Electronic Products	Robert Schin, Western Electric Co., Grandview, Mo.
Lexington	Apr. 20	Adams Restaurant	7:00	t-Test Techniques	T. R. Bainbridge, Tennessee Eastman Co., Kingsport, Tenn.
Lima	Apr. 11	Standard Oil Co., Lima, Ohio	7:30	Sohio Inspectors Apply Statistical Methods	Ray Decker, Standard Oil Company of Ohio, Lima, Ohio
	May 9	Milano's	6:30	Annual Mardi Gras and Installation of Officers	Not applicable
Los Angeles	Apr. 25	IAS Bldg.	7:00	General meeting — Aerojet-General Panel	W. E. Campbell and W. E. Zisch, Aerojet-General Corp.
	Apr. 6	IAS Bldg.	7:00	Inspection Division — Surface Roughness	Jim Broadston, Logistics Division, Rocketdyne
	Apr. 19	IAS Bldg.	7:30	Electronics Division — Administrative Applications	Emil Olsen, AiResearch Division, Garrett Corp.
Memphis	Apr. 18	Holiday Inn, Union Ave.	7:00	Ladies' Night — QC in the Food Industry	Robert N. Johnson, Process Foods Division, Kroger Co., Cincinnati, Ohio
Metropolitan	Apr. 18	American Can Co., Hillside, N.J.	7:30	Ladies' Night — Plant tour	Eldridge Allen, American Can Co., Hillside, N.J.
	May 3	National Cash Register	7:00	The Span Plan	Leonard A. Seder, QC Consultant, Malden, Mass.
Milwaukee	Apr. 17	AC Spark Plug, Oak Creek Plant	....	Plant tour	To be announced

Minnesota	Apr. 11	Holiday Lodge	6:30	A QC Program Should be a Cost Reduction Program	Harmon Bayer, QC Consultant, Detroit, Mich.
Montreal	Apr. 12	To be announced	8:15	Getting Results from Your Training Program	E. N. Beckett, Northern Electric Co., Montreal, Quebec, Canada
	May 10	Ecole Polytechnique, University of Montreal	8:15	Case Histories	Peter F. Wade, Price Waterhouse and Co., Ltd. Montreal
Muncie	Apr. 11	Carpenter's Restaurant State Road 67	6:30	Dinner followed by Plant tour — Kimble Glass Co., joint meeting with Indianapolis section	E. Spence, Kimble Glass Co.
Greater Muskegon	Apr. 20	To be announced	6:30	Presidents' Night	J. Y. McClure, president, ASQC
Northeast Tennessee	Apr. 11	Kingsport, Tenn.	6:00	Experiments in the Chemical Plant	James A. Mitchell, Acid Division, Tennessee Eastman Co., Kingsport, Tenn.
	May 9	Johnson City, Tenn.	6:00	Planning for Incoming Material Control	Chester Gadzinski, Raytheon Co., Waltham, Mass.
Oklahoma City	Apr. 18	Tulsa, Okla.	6:00	Total Quality Control	Dr. A. V. Feigenbaum, General Electric Co. New York, N.Y.
Omaha-Lincoln	Apr. 14	Marchio's Steak House Omaha, Nebr.	6:30	Quality Control in Foods	Brick Hawley, Safeway Stores
Orange Empire	Apr. 18	Anaheim Bowl	7:30	Automation in the Receiving Inspection Function	Howard C. Todt, North American Aviation, Los Angeles, Calif.
Parkersburg	Apr. 12	Chancellor Hotel	7:30	Statistical Significance of Outlying Observations	Dr. F. E. Grubbs, Aberdeen Proving Grounds, Md
Piedmont	Apr. 11	Battery Park Hotel, Asheville, N. C.	6:30	Plant tour — Beta Ray Control	L. J. Trahan, St. Regis Paper Co., Pensacola, Fla
Pensaco.a-Mobile	Apr. 13	St. Regis Paper Co., Pensacola, Fla.	6:30	Problem Solving Techniques	Edward K. Kraybill, College of Engineering, Duke University.
Philadelphia	Apr. 13	General Electric Co., 6901 Elmwood Ave.	....	Plant tour and dinner meeting	To be announced
Pittsburgh	Apr. 25	Downtown YMCA	6:30	Multivariate QC	J. Edward Jackson, Eastman Kodak Co. Rochester, N.Y.
Pittsfield	Apr. 12	Stanley Club	6:00	Ladies' Night, plant tour — Metrology Laboratory, General Electric Co., followed by a dance	Joseph A. Trowbridge, General Electric Co., Pittsfield, Mass.
Portland	Apr. 4	Public Service Bldg.	7:30	Report on Western Regional QC Conference in Los Angeles, Calif.	Herman Kariebach and members of the executive committee
	Apr. 13	Sheraton Hotel	9:00 a.m.	One Day Workshop	Dr. J. M. Juran, Consultant, New York, N.Y.
Rhode Island	Apr. 13	Engineering Society Bldg.	8:00 p.m.	If (Identification and Feedback of Quality Information)	Paul K. Moffat, M. & C. Nuclear Co., Attleboro, Mass.
Rochester	Apr. 18	Chamber of Commerce Bldg.	6:30	ASQC — Past, Present, and Future	J. Y. McClure, president, ASQC
Rockford	Apr. 20	Holiday Inn	7:00	ASQC and You	A. W. Wortham, vice president, ASQC
St. Charles	Apr. 18	Western Electric Co., Montgomery		Plant tour	To be announced
St. Louis	Apr. 21	Golden Fried Chicken Loaf Restaurant	8:00	Instrument and Measurement Evaluation	John A. Henry, University of Illinois
St. Petersburg-Tampa	May 8	"9" Restaurant	8:00	Panel discussion — What is a QC Engineer?	Moderator — Bill Fenn, General Electric Co., St. Petersburg, Fla.
San Antonio	Apr. 18	To be announced	....	Annual Spring Dance	Not applicable
San Bernardino	Apr. 19	Mural House, Ontario, Calif.	7:00	Quality or Else	John J. Crowley, vice president, project management, Grand Central Rocket Co.
San Diego	Apr. 10	Sands Hotel, Clairmont Mesa Blvd. Highway 395	7:00	Importance of Human Engineering in the Everyday Assignment of QC Personnel	Dr. E. Aiken, California Western University
San Francisco	Apr. 10	To be announced	7:00	Legal Aspects of QC in Government Contracts	Office of the Judge Advocate, U.S. Air Force
Scranton-Wilkes-Barre	Mar. 25	YWCA, Scranton, Pa.	9:00 a.m.	Third Annual Fifth District All Day Quality Control Conference	Various
	Apr. 11	Aldino's Restaurant	6:30 p.m.	A Practical Approach to Loss Reduction in Precision Manufacturing	Edward R. Close, Bausch & Lomb Optical Co., Rochester, N.Y.
Seattle	Apr. 11	Seattle	....	Plant tour	To be announced
South Texas	Apr. 19	Ben Milam Hotel	7:00	Demerit Rating System for Evaluating QC Performance	S. D. Krasner, Air Procurement District, St. Louis, Mo.
Southern Illinois	Apr. 20	To be announced		Problems in Inspection	Panel discussion
Syracuse	Apr. 18	Turners	6:30 p.m.	Statistical Methods of Evaluation and Decision-Making in Management	Paul Hill, Fairchild Semiconductors Corp., Mountain View, Calif.
Tennessee	Apr. 20	Knoxville	7:30	Quality Assurance	R. D. Smith, Carbide & Carbon Chemical Co., Oak Ridge, Tenn.
Toledo	Apr. 6	EST Club Rooms	6:30	Reliability	Dr. E. B. Ferrell, Bell Telephone Laboratories, Murray Hill, N.J.
	Apr. 15	Hillcrest Hotel, Toledo, Ohio	9:00 a.m.	Northwest Ohio All Day Conference	Various
Toronto	Apr. 22	Canadian Westinghouse, Hamilton, Ontario	8:00 p.m.	Joint meeting with Hamilton section — A Case Study in Process Control	H. C. Hilditch, Lamp Division, Canadian General Electric Co.
	Apr. 26	City Service Refining of Canada, Ltd.	8:00	Plant tour	Staff
	May 10	Canadian General Electric Co.	8:00	QC in the Chemical Industry	Vance Ward, Canadian Industries Ltd., Toronto, Ontario
Trenton	Apr. 27	Trenton Technical Institute	8:00	Assuring Quality in Ammunition Material	Various
Washington, D.C.	Apr. 19	General Services Administration Auditorium	8:00	Reliability and Its Dependence on the Control of Quality	Enoch Ferrell, Bell Telephone Laboratories, Murray Hill, N.J.
Western Massachusetts	Apr. 11	Sheraton Motor Inn, Springfield, Mass.	6:30	Manufacturing Performance Analysis	F. J. Sindelar, IBM Corp., Poughkeepsie, N.Y.
	May 9	To be announced	6:30	Quality Control — Its Own Best Salesman	W. D. Parker
University of Western Ontario	Apr. 19	Stratford, Ont.	6:30	Quality in Our Canadian Economy	W. E. Currie
Wichita	Apr. 4	Continental Grill	6:30	Calibration Requirements for Government Contracts	W. B. Rice, Measurement Standards Department, Aerojet-General Corp., Azusa, Calif.
	May 2	Continental Grill	6:30	Quality Control Management	W. W. Spencer, Process Control Engineering, General Electric Co., New York City
Worcester	Apr. 17	Carling Brewing Co., Natick, Mass.	7:00	Plant tour — QC at Carling	Donald Davidson, Carling Brewing Co. Natick, Mass.
Youngstown	Apr. 6	Astoria Cafe	6:30	Design of Experiments	Dr. M. E. Terry, Bell Telephone Laboratories, Murray Hills, N.J.
	May 4	Astoria Cafe	6:30	Peculiarities of American Presidents	William Pringle, East Ohio Gas Co.

respect to quality control considerations. He also had complete responsibility for final production testing of Narda's products, both commercial and military.

. . . MONTREAL — **Claude I. Taylor,** Trans-Canada Air Lines, has been elected secretary of the Administrative Applications Division, ASQC, and appointed chairman of the Speaker's List, Saddoris Award Committee, ASQC.

. . . NORTHEAST TENNESSEE — **J. T. Johnston,** section chairman, spoke to the Bristol Lions Club Jan. 27. His topic—"Looking Ahead at Missiles in Space."

In January, **Hubert Hill** spoke on "Statistics in Industry" at East Tennessee State College. Fifty high school mathematics teachers attended Dr. Hill's talk.

Dr. Hill also spoke at the Ketron High School Career Day in November on "Mathematics as a Career."

Thirty-eight section members have reported regular attendance at the Continental Classroom morning sessions on "Probability and Statistics."

John Daly will teach a course in statistical quality control in Bristol, Tenn. The course is sponsored by the state and city school boards and this section. Enrollment is open to the public.

Twenty-three persons are attending the graduate course in statistics in Bristol, Tenn. The course, which is sponsored by this section, is presented by East Tennessee State College.

. . . PHILADELPHIA — **William Kahn,** formerly with Teleregister Corp., Conn., recently joined the General Electric Company as a reliability engineer.

Leonard Miller, formerly with Burroughs Corp., has also joined the General Electric Company as a reliability engineer.

Col. Frederick J. Coffey, Levittown, Pa., has been appointed deputy for quality assurance, U.S. Army Signal Supply Agency, 225 S. 18th St., Philadelphia, Pa., according to Brig. Gen. **Charles S. Hays,** Commanding General. Col. Coffey was formerly Assistant Deputy for Procurement (Contracting) at the Agency.

. . . PITTSFIELD — **Frederick C. Hartwell** has been promoted from QC Coordinator of all mills to manager of the Columbia Mill, Peter J. Schweitzer Co., in Lee, Mass.

Henry Gould has been promoted from research and engineering department, North Adams, Pa., to QC engineer, Concord plant, Sprague Electric Co.

. . . RHODE ISLAND — **Roy Volkman,** Fellow, ASQC, has been named divisional laboratory manager for the mechanical goods division of the U.S. Rubber Co., Passáci, N.J. Mr. Volkman was formerly a project superintendent at the Providence, R.I., plant.

Orval L. Buckner has been appointed QC manager for the Commercial Products Division of General Dynamics/Electronics. He was formerly QC manager for the Radio and Phonograph Division of the Magnavox Corp., Greenville, Tenn.

. . . SACRAMENTO — **R. Q. Steuer** has taken over the duties of our membership chairman. He is also doing an excellent job with arrangements.

F. Shilosky has been doing exceptionally well as program chairman, especially, considering that he accepted the job in the middle of the year.

. . . ST. CHARLES — Our education chairman **Robert Mink** was very pleased with the last minute registration of 15 Navy Inspectors for the intermediate course in statistics, which is being conducted by Ray Swenson.

. . . ST. LOUIS — **Sam Huston** is busy preparing for the Chemical Division course in "Evaluation and Interpretation of Physical and Chemical Testing Methods." This course will be presented May 11-13, 1961, at the Sheraton-Jefferson Hotel in St. Louis, Mo. The fee for this course will be $100.

. . . ST. PETERSBURG-TAMPA — The following section members attended the QC Symposium in Philadelphia in January — **H. P. Stadnik** and **H. Z. Snyder,** ECI, and **Charles French,** General Electric Co.

. . . SAN BERNARDINO — **Walter J. Willey** is now in charge of the statistical section, reliability group, Space Sciences Department, Aerojet-General Corp.

. . . SOUTH TEXAS — **Jack Kirby** is transferring to the Cincinnati section. In his new position, he will be supervisor of quality control engineering, Plumbing and Heating Division, American Standard Corp.

. . . SOUTHERN ILLINOIS — **Clifford A. Statler,** section chairman, has been promoted to quality assurance manager of the Crab Orchard Plant, Universal Match Corp. He was formerly chief inspector.

R. D. Vancil has been promoted from general inspection foreman to chief inspector of the quality assurance department of the Crab Orchard Plant, Universal Match Corporation.

. . . TENNESSEE — **H. B. Hugh,** quality control pharmacist, Abbott Laboratories, Oak Ridge, Tenn., has become a member of the Tennessee section.

. . . WASHINGTON, D.C. — Our section chairman, **A. C. Rosander,** formerly of the Internal Revenue Service, has taken a position with the Interstate Commerce Commission.

Arthur Schneyman, operations research analysis, Washington Gas and Light Co., and a member of the part time staff of the School of Engineering George Washington University, has transferred from the Washington, D.C., section to the Metropolitan section. He has also taken a position with operations research division, Socony Corp., New York City.

Eugene Tucker of the Statistical Methods Division, Bureau of the Census, has been named section reporter for *IQC*. Report all news items to "Gene" at the Bureau, Ext. 7154.

Good luck in your new positions!

. . . WICHITA — **Lynn Hibbs,** QC manager, Coleman Co., our program chairman, is to be commended for the careful selection of speakers and subjects for the current season. Every meeting has been outstanding and we anticipate equally good meetings throughout the remainder of the season.

ASA Publishes 1961 Catalog

Publication of the 1961 Catalog of American Standards has been announced by the American Standards Association.

This 72-page booklet includes the price list and index of over 1950 American Standards in such fields as civil engineering and construction, mechanical and electrical engineering, photography and motion pictures, materials handling and nuclear energy.

Standards recommendations which have been approved and published by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) are listed and indexed.

All of the standards shown (except for ISO and IEC Recommendations) have been developed by national groups who have used the ASA's procedures to obtain standards supported by a national consensus.

Over 1,000 national organizations (industry, engineering, science, professional and consumer groups, Federal government departments and agencies) are participating in the more than 425 projects which have been set up under ASA procedures at the national level.

Hundreds of American interests are likewise represented through ASA in standards projects organized under the ISO and IEC.

Founded in 1918 to serve as the focal point of voluntary national standardization in the United States, the ASA is a federation of 122 national trade, professional and consumer groups and counts 2200 companies as sustaining members.

American Society for Quality Control is one of the federation members and is proprietary sponsor of ASA project Z1, Application of Statistical Methods to Quality Control of Materials and Manufactured Products.

Reliability Engineering Technical Committee

The Reliability Engineering Technical Committee, ASQC, was organized early in 1957 as an *Ad Hoc* group. Much of the early effort was to learn more about the statistical techniques used in prediction and to link data feedback to in-process corrective action. In 1959, a formal organization was established as a Technical Committee and given the name Reliability Engineering Technical Committee.

The committee has four elected officers, six divisional representatives, an executive committee trustee and reports to an ASQC vice president. The current activities are:

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Each Task Committee operates under the guidance of the elected vice chairman. The membership of each committee is a joint selection of the vice chairman and the specific task committee chairman. Periodic review meetings are held independently by the vice chairmen with their committees, and the combined function prepares an annual report for the ASQC Board of Directors.

Further information may be obtained by writing the secretary:

Mrs. Vida Hildyard
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Your interest in this ASQC Reliability Engineering Technical Committee is sincerely appreciated.

ASQC Personnel Listing Service

A personnel listing service exists for the use of ASQC members only. Any member desiring to be listed as available for new employment opportunities should send a brief resume (on 3 × 5 file card, or cards) to ASQC Personnel Listing Service, Room 6185 Plankinton Building, 161 West Wisconsin Avenue, Milwaukee 3, Wisconsin.

All information will be kept confidential and those listed will be sent descriptions of all suitable opportunities for 60 days following receipt of this initial listing. If it is your desire to remain on the list after this period, you can do so by writing in to the same address and requesting an additional 60 day period. If you do *not* request an extension, your resume will be removed from the file on the assumption that you have made a successful connection.

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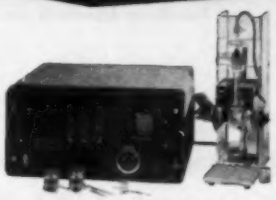

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LINARDAKIS, NICHOLAS, Newark, N. J.
LOOS, CHARLES J., Belleville, Mich.
LOWNEY, ROBERT E., Minneapolis, Minn.
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THOMPSON, SAMUEL, Detroit, Mich.
TOFIL, EDWARD, Hamtramck, Mich.
WALLIS, TRUMAN E., Southfield, Mich.
WALSH, WILLIAM W., Detroit, Mich.
WARREN, ROBERT W., Wayne, Mich.
WEDMORE, DANIEL B., Wilmington, Del.
WELLOCK, EDWARD S., Bloomfield Hills, Mich.
WERWATH, WALTER E., Chicago, Ill.
WOODRUFF, ROBERT W., Inkster, Mich.

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FLOEHR, DONALD J., Houston, Texas
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VALLEY, DON J., Portland, Ore.
VENCILL, CHARLES A., Carmichael, Cal.
WEDGE, DANIEL G., Houston, Texas
WEISS, ARNOLD I., Newark, Del.
WHITE, M. BRADY, Houston, Texas
WINTER, DONALD R., Minneapolis, Minn.
YEAGER, C. ROBERT, North Attleboro, Mass.
YURCICK, CHARLES P., Allentown, Pa.

STUDENT ENROLMENTS

(as of December 31, 1960)

SCARINGELLA, FELIX A., White Plains, N. Y.
SCHWARTZENBERG, ALAN C., Chicago, Ill.

(As of January 31, 1961)

DIECKMAN, G. DWIGHT, Webster Groves, Mo.

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MARCH

. . . 25—Third Annual Fifth District All Day Quality Control Conference, Scranton, Pa., contact Eugene Krautter, QC manager, General Electric Co., P.O. Box 1068, Scranton, Pa.

. . . 27-31—3rd Symposium on Temperature—Its Measurement and Control in Science and Industry, Veterans' Memorial Hall and Deshler-Hilton Hotel, Columbus, Ohio. Sponsored by ISA, American Institute of Physics, and National Bureau of Standards. Contact ISA, 313 Sixth Ave., Pittsburgh 22, Pa.

. . . 28—17th Annual Quality Control Clinic, University of Rochester, Rochester, N.Y., sponsored by the Rochester section, ASQC. Contact Albert D. Rickmers, associate professor, College of Graphic Arts and Photography, Rochester Institute of Technology, 65 Plymouth Avenue South, Rochester 8, N.Y.

APRIL

. . . 5-7—Annual meeting of the Institute of Environmental Sciences, Sheraton Park Hotel, Washington, D.C., 70 presentations during three parallel morning and afternoon sessions, contact Institute of Environmental Sciences, Box 191, Mt. Prospect, Ill.

. . . 6-8—Sixth ASQC Workshop-Seminar, Hotel Roosevelt, New York City, Paul C. Clifford, director, professor at Montclair State College. Address inquiries to: Sixth ASQC Workshop-Seminar, ASQC, 161 W. Wisconsin Ave., Milwaukee 3, Wis.

. . . 12-13—Third Symposium on Information and Decision Processes, Purdue University, Lafayette, Ind. Contact Purdue University.

. . . 15—Northwest Ohio All Day Conference, Hillcrest Hotel, Toledo, Ohio. Contact Nelson G. Meagley, Continental Aviation Engineering Corp., 1301 Laskey Rd., Toledo 13, Ohio.

. . . 15—Opening day of a 30 day showing of "Plastics—A New Dimension in Buildings," in Springfield, Mass., the first educational and technical traveling exhibit of the Society of Plastics Engineers. The exhibit will travel to some 16 major North American cities for 30-day showings during 1961-63. This educational exhibit is designed to disseminate technical information to architects, builders, contractors, interior designers and students in these professions. A one-day SPE Regional Technical Conference on the same subject will be held in Springfield, Mass., Apr. 20. Contact Society of Plastics Engineers, Inc., 65 Prospect St., Stamford, Conn.

. . . 17-19—7th National ISA Symposium on Instrumental Methods of Analysis, Shamrock-Hilton Hotel, Houston, Texas. Contact ISA, 313 Sixth Ave., Pittsburgh 22, Pa.

. . . 17-21—Intensive short course in Strain Gage Techniques co-sponsored by Southwest Research Institute and the Society for Experimental Stress Analysis. Lecture program tuition—$175, supplemental laboratory tuition—$100. Submit applications and tuition by Apr. 10. Contact Dr. M. M. Lemcoe, Southwest Research Institute, Box 2296, San Antonio 6, Texas.

. . . 19—Reliability and Its Dependence on the Control of Quality by Mr. Enoch Ferrell, Bell Telephone Laboratories, Murray Hill, N.J. Dinner at Rich's, 6:30 p.m., 19th and E Streets, Northwest, and panel at General Services Administration Auditorium, 8 p.m., F Street, between 18th and 19th St., N.W. Contact Alfred McKeon, Bureau of Census, Washington, D.C., LU 4-3000, Ext. 285.

. . . 23-May 5—Advanced QC Course, University of Connecticut, Storrs, Conn., contact Richard M. Story, Jr., University of Connecticut, Storrs, Connecticut.

. . . 28—Third Annual Quality Control Conference sponsored by the Akron-Canton section at Akron University, Kolbe Hall, Akron, Ohio. Contact N. W. Miller, Goodyear Tire and Rubber Co., 1144 East Market St., Akron 16, Ohio.

. . . 30-May 4—7th National Aero-Space Instrumentation Symposium, Adolphus Hotel, Dallas, Texas. Contact W. J. Gabriel, Group Engineer, Convair Division, General Dynamics Corp., Fort Worth, Texas.

Short Courses in Quality Control

Usual Time Course is Held	*Type of Course*	*Where Held*	*Course Director*
February	Basic	University of Illinois, Urbana, Ill.	John A. Henry
Apr. 23.-May 5	Advanced	University of Connecticut, Storrs, Conn.	Richard M. Story, Jr.
May 19-26	Basic (Textile Ind)	North Carolina State College, Raleigh, N.C.	David B. Stansel
June 5-9	Basic (Graphic Arts)	Rochester Institute of Technology, Rochester, N.Y.	Harold Kentner
June 7-17	Design of Experiments	Purdue University, Lafayette, Ind.	Charles R. Hicks
June 11-23	Reliability Institute	University of Connecticut, Storrs, Conn.	Richard M. Story, Jr.
June 12-21	Basic (Chem. Ind)	Rochester Institute of Technology, Rochester, N.Y.	Harold Kentner
June 22-29	Advanced (Chem. Ind.)	Rochester Institute of Technology, Rochester, N.Y.	Harold Kentner
July	Basic	TAPPI Statistics Course, Queens University, Kingston, Ontario, Canada	.....
July	Advanced	TAPPI Statistics Course, Queens University, Kingston, Ontario, Canada	.....
July 31-Aug. 11	Statistical Methods In Industry	UCLA, Los Angeles, Calif.	Edward P. Coleman
August 21-31	Basic	University of Michigan, Ann Arbor, Mich.	C. C. Craig
September 5-15	Advanced	Purdue University, Lafayette, Ind.	Irving W. Burr
September 10-22	Basic	University of Connecticut, Storrs, Conn.	Richard M. Story, Jr.

MAY

. . . **9**—Plastics in the Automotive Industry sponsored by the SPE Detroit section in cooperation with the SPE Plastics in the Automotive Industry Professional Activity Group, contact John A. McPherson, Underground Products Inc., 12801 Inkster St., Livonia, Mich.

. . . **9-11**—1961 Western Joint Computer Conference, Ambassador Hotel, Los Angeles, Calif. Papers on systems, applications and circuitry for both digital and analog computers. Contact C. T. Leondes, associate professor of engineering, Department of Engineering, University of California, Los Angeles 24, Calif.

. . . **11-13—Course on Evaluation and Interpretation of Physical and Chemical Test Methods, Sheraton-Jefferson Hotel, St. Louis, Mo. sponsored by the St. Louis section and the Chemical Division, ASQC. Instructors are John Mandel, National Bureau of Standards, and Grant Wernimont, Eastman Kodak Co. Course fee $100. Contact S. H. Huston, Mallinckrodt Chemical Works, Uranium Division, P.O. Box 472, St. Charles, Mo.**

. . . **11-13**—12th Annual National Conference and Convention, American Institute of Industrial Engineers, Inc., Sheraton Cadillac Hotel, Detroit, Mich. Contact James E. McCartney, 12th Annual AIIE Conference, Rm. 29, 4181 Oakman Blvd., Detroit 4, Mich.

. . . **13—Quality Management Workshop under the direction of Dr. J. M. Juran, sponsored by the Portland ASQC section, contact George E. Mickel, Longview Fibre Co., P.O. Box 7035, Portland 19, Oregon.**

. . . **14-17**—Spring Meeting, National Fluid Power Association, The Greenbrier, White Sulphur Springs, W. Va. Contact NFPA, 5595 N. Hollywood Ave., Milwaukee 17, Wis.

. . . **17—Achieving Quality, Including Reliability, at a Minimum Cost, by Dr. Harry Romig, Operations Research, Inc., Los Angeles, Calif. Dinner at Rich's, 6:30 p.m., 19th and E Streets, Northwest, and panel at General Services Administration Auditorium, 8 p.m., F Street, between 18th and 19th St., N.W. Contact Alfred McKeon, Bureau of Census, Washington, D.C., LU 4-3000, Ext. 285.**

. . . **18-19**—Quality Control's Role in Industry, Industrial Engineering Institutes, Memorial Union, Iowa State University, Ames, Ia. Contact Engineering Extension, Iowa State University, Ames, Ia.

. . . **19-26**—Basic QC Course for the Textile Industry, North Carolina State College, Raleigh, N.C. Contact David B. Stansel, North Carolina State College of Agriculture and Engineering, Division of College Extension, P.O. Box 5125, Raleigh, North Carolina.

. . . **22-26**—Annual Conference of the Society of Photographic Scientists and Engineers, Arlington Hotel, Binghamton, N.Y. Contact SPSE, Box 1609, Main Post Office, Washington, D.C.

. . . **22-27—Northeast Reliability Training Course, Sheraton Inn, Syracuse, N.Y. sponsored by the Electronics Division, ASQC, and the Institute of Radio Engineers. Registration fee of $225 will cover cost of course materials, lunches and one dinner. Contact Mrs. N. J. McAfee, 2106 Tucker Lane, Apt. A-8, Baltimore 7, Md.**

JUNE

. . . **5-7—15th Annual Convention and Exhibit, American Society for Quality Control, Hotel Sheraton, Philadelphia, Pa., see pages 27-29, this issue.**

. . . **5-9**—Basic QC Course for the Graphic Arts Industry, Rochester Institute of Technology, Rochester, N.Y., contact Harold Kentner, Director, Extended Services, RIT, Rochester, New York.

. . . **5-16**—Intensive course in Work Design sponsored by the Department of Industrial Engineering and University College, the Adult Education Division, Washington University, St. Louis, Mo. The course will be conducted in the new Engineering Laboratory Building on the campus. Arrangements have been made for participants to be housed in the new, air-conditioned dormitories. Contact University College, Washington University, St. Louis 30, Mo.

. . . **7-17**—Design of Experiments Course, Charles R. Hicks, instructor, Purdue University, Lafayette, Ind., contact Statistical Laboratory, Engineering Administration Bldg., Purdue University, Lafayette, Indiana.

. . . **11-23**—Reliability Institute, University of Connecticut, Storrs, Conn., contact Richard M. Story, Jr., University of Connecticut, Storrs, Connecticut.

. . . **12-21**—Basic QC Course for the Chemical Industry, Rochester Institute of Technology, Rochester, N.Y., contact Harold Kentner, Director, Extended Services, RIT, Rochester, N.Y.

. . . **13**—Fourth Graduate Summer Program of Statistics in the Health Sciences, June 13 through July 28, University of Minnesota. Persons interested in course work in elementary or advanced statistics, vital records, records management, design of experiments, bioassay, sampling, demography, and statistical aspects of nutrition research, genetics, pharmacology and mathematical models are invited to attend. Stipends are available to qualified students. Experts such as Cochran, Cox, Li, Chiang, Bailey, Patton, and others will be teaching. House, food and course fees will be about $300. Contact Biostatistics, 1226 Mayo, University of Minnesota, Minneapolis 14, Minn.

. . . **15**—Southern Regional Graduate Summer Session in Statistics, Virginia Polytechnic Institute, Blacksburg, Va., June 15 through July 22. The Virginia Polytechnic Institute, Oklahoma State University, North Carolina State College, and the University of Florida have agreed to operate a continuing program of graduate summer sessions in statistics to be held at each institution in rotation. The session will last six weeks and courses will carry five quarter hours of credit. Not more than two courses may be taken for credit at any one session. The summer work in statistics may be applied as residence credit at any of the cooperating institutions, as well as certain other universities, in partial fulfillment of the requirements for a graduate degree. Courses are statistical methods, sampling theory, applied

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statistics for engineers and physical scientists; theory I, probability; theory II, statistical inference; theory III, theory of linear hypotheses; non-parametric methods and multivariate methods. A number of courses in advanced mathematics will be available during the summer session. A series of Colloquia involving recent developments in statistical theory and methods will be conducted during the special summer session. Requests for application blanks and for fellowships should be addressed to Dr. Boyd Harshbarger, Head, Department of Statistics, Virginia Polytechnic Institute, Blacksburg, Va.

. . . **22-29**—Advanced QC Course for the Chemical Industry, Rochester Institute of Technology, Rochester, N.Y., contact Harold Kentner, Director, Extended Services, RIT, Rochester, New York.

. . . **26-July 1**—International Measurement Conference at the Engineering Societies Bldg., Budapest, Hungary. Proposals concerning papers to be read or inquiries concerning details should be directed to J. Johnston, Jr., president of the Instrument Society of America, Dupont de Nemours, Wilmington 98, Delaware, or write directly to IMEKO Secretariat: Budapest, 5. POB 3.

. . . **28-30**—Second Joint Automatic Control Conference, University of Colorado campus, Boulder, Colo., sponsored jointly by ISA, AIChE, AIEE, ASME and IRE. General program chairman is H. M. Paynter, Mechanical Engineering Dept., Massachusetts Institute of Technology.

JULY

. . . **31-Aug. 11**—Statistical Methods in industry series of seven concurrent courses at the University of California, Los Angeles, Calif. Courses are QC by statistical methods; industrial statistical methods; statistical design and analysis of industrial experiments; probability and statistics of reliability; engineering and management of reliability; basic measurements and standards, and fundamental principles of non-destructive testing. Contact Edward P. Coleman, Professor of Engineering, University of California, Los Angeles 24, Calif.

AUGUST

. . . **21-31**—Basic QC Course, University of Michigan, Ann Arbor, Mich., contact C. C. Craig, Statistical and Computing Laboratory, 106 Rackham Bldg., University of Michigan, Ann Arbor, Michigan.

SEPTEMBER

. . . **5-15**—Statistical Methods and Advanced QC Course, Irving W. Burr, Instructor, Purdue University, Lafayette, Ind., contact Statistical Laboratory, Engineering Administration Bldg., Purdue University, Lafayette, Indiana.

. . . **10-22**—Basic QC Course, University of Connecticut, Storrs, Conn., contact Richard M. Story, Jr., University of Connecticut, Storrs, Connecticut.

ASQC Annual Convention

Future Dates

June 5-7, 1961	**Philadelphia**
May 23-25, 1962	**Cincinnati**
May 20-22, 1963	**Chicago**
May 4-8, 1964	**Buffalo**
May 4-8, 1965	**Los Angeles**
June 1-3 1966	**New York**

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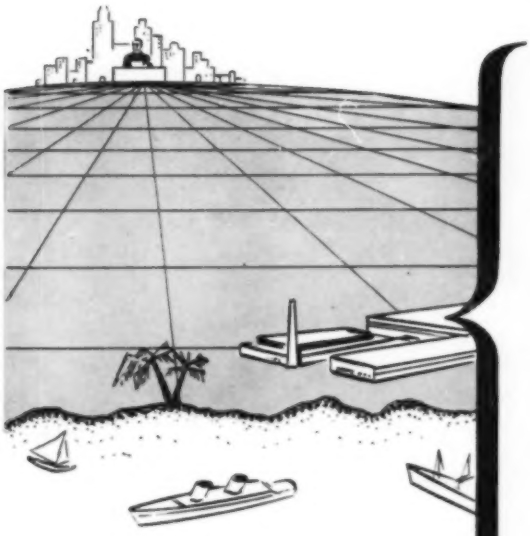

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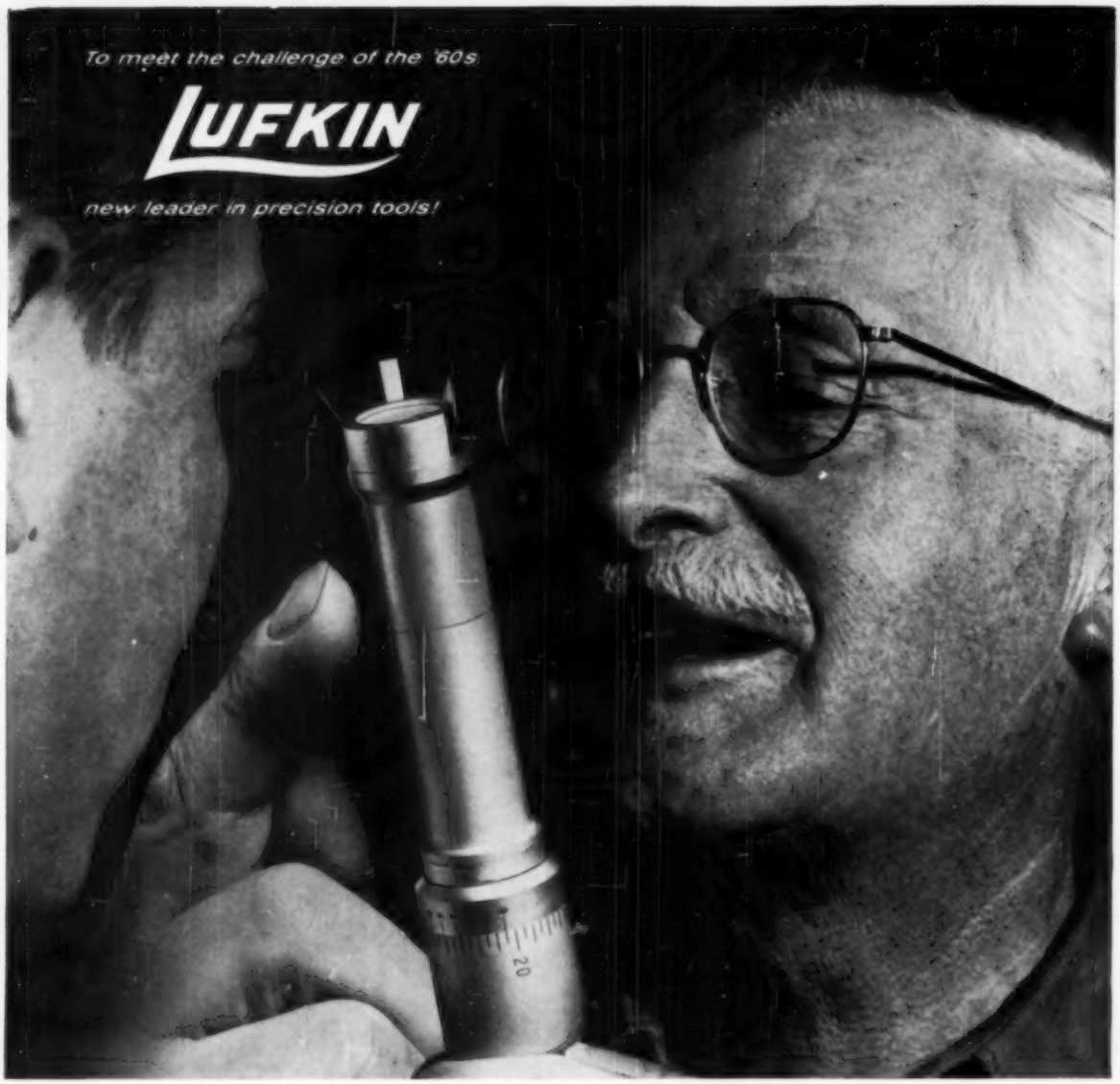

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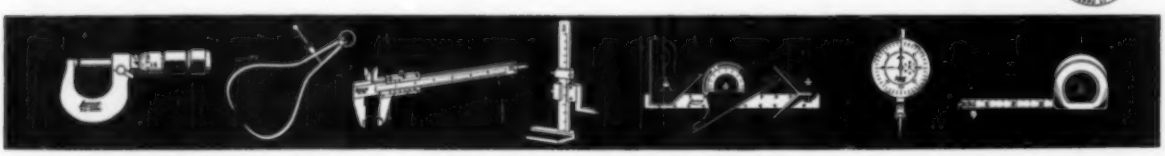
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